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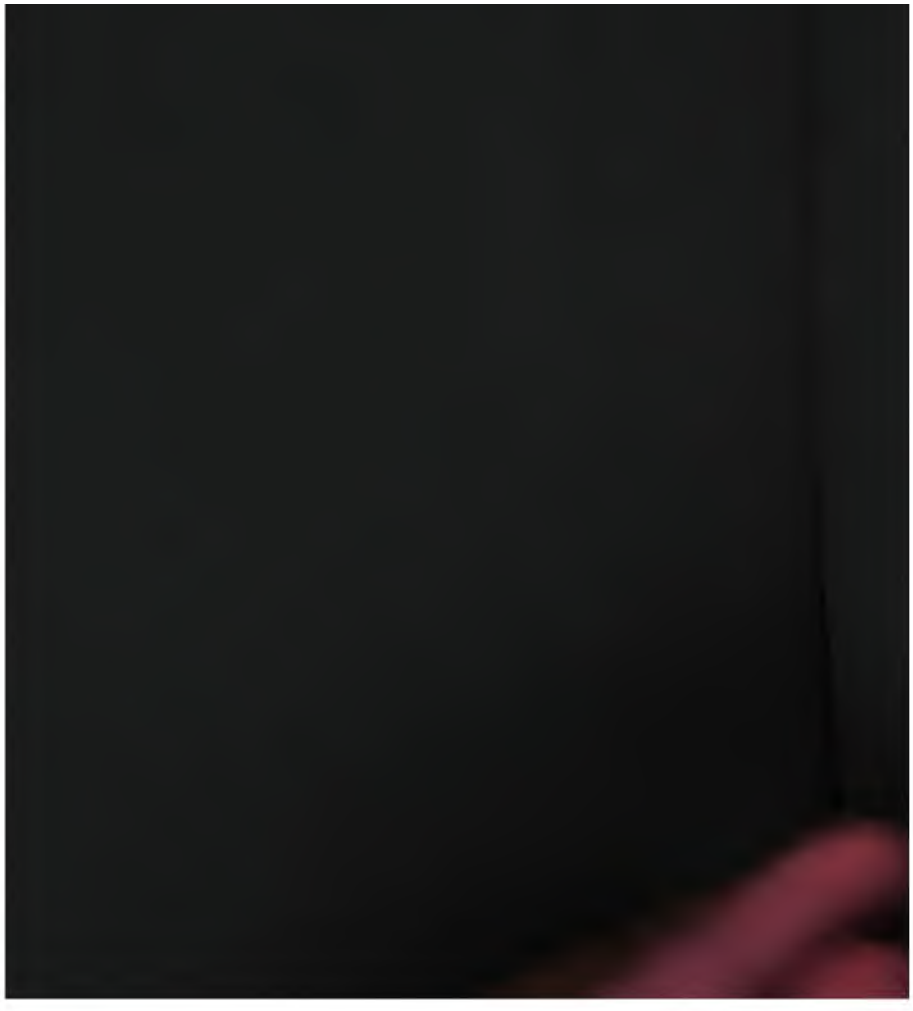

THE

POPULAR ENCYCLOPEDIA;

OR.

CONVERSATIONS LEXICON.

THE

POPULAR ENCYCLOPEDIA;

OR,

CONVERSATIONS LEXICON.

BEING

A DICTIONARY OF SCIENCE AND ARTS, LITERATURE, BIOGRAPHY, HISTORY, AND GENERAL INFORMATION.

EDITED BY

CHARLES ANNANDALE, M.A.,

EDITOR OF OGILVIE'S IMPERIAL DICTIONARY OF THE ENGLISH LANGUAGE, NEW EDITION.

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NEW AND REVISED EDITION, IN FOURTEEN VOLUMES.

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NEBULA—PETERSFIELD.

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THE

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NEBULA, a name applied to any celestial object which is cloudlike (nebulæ somewhat resemble faint comets or specks of luminous fog) to the naked eye or when viewed through a telescope. Many objects cloudlike to the naked eye, are resolved or separated into distinct stars when viewed through telescopes. As more and more powerful telescopes have been employed in examining the heavens, the number of resolvable nebulæ or cloudlike star clusters has become greater and greater, and as many nebulæ irresolvable at present may appear to be star-clusters in telescopes more powerful than those now employed, it is thought convenient to use the name nebula in a general sense, as above defined. The spectroscope has, however, shown that many nebulæ are really irresolvable into star-clusters, and consist of masses of glowing or incandescent gas; it is likely that the name nebula will be restricted to these gaseous bodies when this discovery, which is due to Mr. Huggins, has enabled astronomers to classify cloudlike celestial objects.

Five nebulæ were known to the ancients; the telescope showed that they existed in great numbers in the heavens; Lacaille and Messier examined many of these objects, Messier forming a list of 103. Sir W. Herschel discovered 2500 nebulæ. Sir John Herschel, revising his father's work, discovered 500, and proceeding to the Cape of Good Hope he added 1700 southern nebulæ to the list. The number now known to astronomers may be about 5700. Sir John Herschel invented a plan of charting to exhibit the distribution of celestial objects; it is found that his irresolvable nebulæ in the northern hemisphere exhibit a marked preference for a certain district, and a marked avoidance of the Galactic Zone, and that they exhibit few indications of what Mr. Proctor terms a 'stream formation;' but in the southern hemisphere they are distributed more uniformly, exhibiting marked condensation only in the neighbourhood of the Magellanic clouds, towards which all the nebulæ appear to flow in streams with rich extremities. It is found that clusters, planetary nebulæ, and irregular nebulæ (see below) show a very marked preference for the Milky Way; in fact, with increasing apparent resolvability we find an increasing preference for the Milky Way. Nebulæ have been classified as follows:—1. Clusters of stars, either of a globular form with indications of condensation towards the central parts, or of irregular form, and apparently in a less advanced state of concentration. 2. 'Resolvable nebulæ,' differing from clusters in having no visible outlying branches, and somewhat resembling clusters as seen through telescopes of low power. 3. 'Irresolvable nebulæ,' of elliptic, spiral, annular, and irregular forms. 4. 'Planetary nebulæ,' so called because they slightly resemble in appearance the larger planets; they present circular and elliptic discs of faint light, which differ much as to the definition of their margins, and which are sometimes traversed by more luminous branches and sprays; three-fourths of the known planetary nebulæ are in the southern hemisphere, and several are noticeably of a blue tinge. 5. 'Spiral' or 'whirlpool' nebulæ; the true nature of these was not recognized by Sir Wm. Herschel; he found the nebula 51 Messier to present the appearance of a bright globe or disc unequal in its brightness, divided for about two-fifths of its circumference into two laminæ, one of which seemed turned up out of the plane of the rest; Lord Rosse's telescope showed that what had been taken for an upraised lamina was really the coil of a great spiral. Lord Rosse and Mr. Lassell have discovered a number of spiral nebulæ. 6. 'Nebulous stars.' A bright star is often seen in the centre of a circular nebula, or two bright stars are associated with a double nebula, or with two distinct nebulæ near each other. Sir W. Herschel adopted a theory with regard to these which is very different from his usual nebula theories; he considered them as stars in the process of formation. It is difficult to accept this theory for these particular objects without extending it to all known nebulæ. 7. 'Irregular nebulæ' which are, perhaps, the most remarkable of celestial objects. They are unlike all other forms of nebulæ, and seem to consist of fantastic convolutions and folds of nebulous matter. They all lie in or near the Milky Way. Sir J. Herschel imagined them to be stellar systems like our own galaxy, situated at almost infinite distances away from us in space. It is, however, more reasonable to suppose that they belong to our own system, for they are always found in parts of the heavens where there are bright stars, and it would seem that comparative proximity enables us to see matter surrounding certain star systems which in reality also surround many distant groups. Again, some of these nebulæ are found to vary very much in appearance from time to time; thus the great nebula surrounding the variable star η Argûs is variable, and the spectroscope tells us that the star contains the same kind of vapour as that which composes the nebula. Some nebulæ vanish altogether from the view, afterwards reappearing; sometimes they seem periodically to undergo great condensation, and they even appear as bright stars. These observations render Sir J. Herschel's theory very improbable.

Mr. Huggins overcame the difficulty of examining spectroscopically the very faint light of nebulæ. He states that some of the nebulæ visible in a moderately large telescope have only the $\frac{1}{250000}$ part of the light of a sperm candle viewed at the distance of a mile.

In August, 1864, he first turned his stellar spectroscope on a planetary nebula in the constellation Draco. To his astonishment he found it to consist of an incandescent mixture of the gases hydrogen and nitrogen. He has since examined the spectra of a great number of these objects. Of the seventy which he had examined in 1870 about one-third are evidently gaseous; the spectra of the others being apparently continuous. The well-known nebula in Andromeda, which is visible to the naked eye, and has sometimes been mistaken for a comet, gives a continuous spectrum. It is found that the close association of points of light in a nebula must not be accepted as an indication of resolvability into stars; for these luminous points in many cases only indicate the existence of places of greater gaseous density than common. Many of the nebulæ which had hitherto appeared to be well authenticated clusters have proved to be really masses of incandescent gas.

NEBULAR HYPOTHESIS, a theory by means of which Laplace (before the existence of nebulous matter in the universe had been discovered by means of the spectroscope) accounted for those features of the solar system which must be regarded as accidental in the Newtonian philosophy—1, The orbits of the planets are nearly circular; 2, The planes of all these orbits are nearly the same; 3, The direction of motion of all the planets is the same, and this direction is that of the motion of the secondary planets round their primaries, and of planetary axial rotation. Laplace supposed that the solar system once consisted of a vast rotating globe of incandescent gaseous matter extending far beyond the most distant planetary orbits. Cooling caused this matter to contract, and the globe to rotate more rapidly, until the centrifugal force of the outer portions becoming greater than gravitating forces, a ring of nebulous matter separated itself from the equatorial parts of the globe. Further cooling and contraction caused the mass to part with other like rings, which continued to rotate round the centre of the globe in its equatorial plane. Slight differences in the constitution of different parts of a ring would cause it in time to become a number of aggregations, each of which would rotate whilst it still described its orbit round the inner masses. These pieces would, as a general rule, coalesce in time to form a planet rotating in the same direction as that in which it moved in its orbit. The theory explains the existence of secondary planets, the zone of asteroids, &c. It assumes that all the countless stars of the universe and their planetary systems have contracted from the nebulous state. It may take long years to prove or disprove the hypothesis, but it certainly has received considerable confirmation from spectroscopic researches, the development of the laws of energy, and other principles of natural philosophy.

NECHO, or NEKU, a king of Egypt, the second of the Saite dynasty, son and successor of Psammetichus I. He probably reigned from 612 or 610 B.C. to 596 or 594 B.C. In the early part of his reign he extended the boundary of his dominions to the Euphrates. On this occasion he defeated Josiah, king of Judah, who was slain at the battle of Megiddo, deposed his successor Jehoahaz, and set up Eliakim under the name of Jehoiakim in his stead (2 Kings xxiii.). Three years later (in 605 B.C.) he was himself completely defeated by Nebuchadnezzar, afterwards king of Babylon, at Carchemish. In his reign an Egyptian fleet is said to have sailed round Africa.

NECK, the term applied to the juncture of the head in the higher animals with the trunk or body, and also used in anatomy to indicate any attenuated process or part of a bone which serves to unite or support parts of larger proportions; for example, the neck of the femur or thigh-bone, the neck of the humerus, of the radius, &c. In man the cervical or neck vertebræ number seven; and this number is wonderfully constant throughout the great Mammalian class. Even the giraffe, with a neck of exceedingly elongated proportions, has but seven cervical vertebræ; and in the short-necked porpoise seven segments are also found. The most notable exceptions to this general rule are presented by the manatees and by the *Cholœpus*, or Two-toed Sloth, each with six neck-vertebræ; whilst in the Three-toed Sloth nine cervical segments exist. In long-necked Birds (for example, swan) as many as twenty-five cervical vertebræ may be present. In Fishes no neck or cervical region is distinguishable. The ligamentous structures connected with the head and neck, and with the articulation of the skull upon the vertebral column, form a very complicated series; and in the lower animals especially—as in the horse or elephant—we find a strong band of fibres, forming the *ligamentum nuchæ*, which suspends the head on the neck. In Man, in whom the head is balanced on the spinal column (see MAN), this ligament is of comparatively small size, and it extends from the occipital protuberance at the back of the skull to the spine of the seventh or last cervical vertebra. The muscles of the neck are numerous, and are generally classified and described along with those of the head. The chief muscles are the sterno-cleido-mastoid, the digastric, the stylo-hyoid, stylo-glossus, and stylo-pharyngeus, mylo- and genio-hyoids, hyo- and genio-glossus, &c. &c.

NECKAR, a river of Germany, which rises in the Black Forest in Würtemberg, near one of the sources of the Danube, and flows through Baden into the Rhine at Manheim, after a course, including windings, of about 240 miles. The area of its basin is 4150 square miles. It is navigable for small boats as far as Cannstadt, but the actual navigation of the river extends only as high as Heilbronn, up to which steamers ply. The Neckar wines are light, sound, and of an agreeable flavour.

NECKER, JACQUES, minister of finance to Louis XVI., was born in 1732 at Geneva. In 1750 he went to Paris to enter the banking-house of his uncle, M. Vernet, and having himself become partner in a banking business, he in a few years acquired an immense fortune. After giving up his business he held the post of resident minister at Paris, representing his native town. Ambitious of literary distinction, he produced his Éloge de Colbert, which gained the prize of the French Academy. His Essai sur la Législation et le Commerce des Grains (1775) was violently attacked by the Economists, owing to the author expressing himself in favour of some restrictions on the exportation of corn. In October, 1776, he was appointed to a place in the direction of the royal finances, and in the summer of 1777 he obtained the supreme administration of the treasury. Necker assumed his post in a difficult moment. Malversation, under the preceding reign, had caused a great deficit, to which the American war made great additions. New taxes would have been unpopular, and Necker endeavoured to meet the exigency by loans and reforms. But the partisans of Turgot, who had formerly had the administration of the state finances, found fault with his innovations. In 1781 he published his Compte rendu au Roi, relative to his administration. This statement of the financial condition of the nation found great favour with the people; but it displeased the court, and Necker received his dismissal in May, 1781. He went to Switzerland, where he purchased the barony of Coppet, and published his work, Administration des Finances (three vols.), of which 80,000 copies were sold in a few days. His enemies accused him of

undermining the foundations of the monarchy by exposing the secrets of government, and of exchanging the character of counsellor of his prince for that of a tribune, by appealing from the king to the people. The errors and prodigality of Calonne, who next had the management of the state finances, increased Necker's reputation: the latter returned to France in 1787, wrote against Calonne, who had accused him of being the author of the deficit, and was exiled in consequence. But in 1788 Necker was recalled as controller-general, and accepted the post. His convictions led him to support the convocation of the states-general, which was the wish of the nation, and the giving a double representation to the *tiers état*. The states-general were actually summoned to meet on the 1st of May, 1789; but Necker had not the courage to go further and determine the mode in which the estates were to deliberate and to vote. When the court in a royal sitting, held on the 23d of June, 1780, wished to annul the decision of the third estate, by which the National Assembly was constituted, Necker refused to appear in the sitting. On the 11th of July the advisers of the king succeeded in inducing him to give Necker his dismissal, and to order him to leave the kingdom. No sooner was his removal known than all Paris was in a ferment. The storming of the Bastille followed (July 14), and the symptoms of popular violence became so alarming that the king found himself compelled to recall the banished minister. His return to Paris resembled a triumphal procession. His first object was to restore tranquillity, and security of person and property. But as minister of finance he was obliged to propose measures which could not be acceptable to the populace. His moderate opinions in regard to the administration of government did not keep pace with the wishes of those who dictated to the people. Mirabeau, in particular, whose character rendered him more fit to rule the popular will, undermined Necker's influence. Under these circumstances he wrote to the Assembly, in September, 1790, requesting his dismissal. He offered to place in their hands the 2,000,000 livres which he had advanced to government, together with his house and appurtenances, as a pledge of his integrity. His offer was received without any marks of regret, and he left Paris with the mortification of seeing his plans and prospects fail. His daughter, Madame de Staël, has given a somewhat too favourable view of his character as a statesman in her Considérations. He returned to Coppet amidst the insults of the people. Towards the close of his life he occupied himself in writing a defence of his administration. Among his other works are Réflexions adressées à la Nation; an essay Du Pouvoir exécutif dans les grands États (two vols. 1792); De la Révolution Française (1796, four vols.); Cours de Morale religieuse (1800, three vols.); and De l'Importance des Opinions religieuses (1788). He died at Coppet in 1804.

NECROMANCY (from *nekros*, dead, and *manteia*, divination), the divination of the future by questioning the dead. This, like many superstitious rites, originated in the East, or the extreme north, and is of the highest antiquity. Some have, indeed, maintained that it was not brought from Egypt or Persia to Greece, but originated in the last country; but it is difficult to prove this. We find mention made of necromancy in the Old Testament; for instance, in Deuteronomy (xviii. 11), where it is forbidden. In the 28th chapter of the first book of Samuel the witch of Endor is related to have raised up Samuel to gratify the desire of Saul. In the eleventh book of the Odyssey Homer has made Ulysses raise the shade of Tiresias from the infernal regions. In many parts of Greece there were oracles of the dead, the origin of which is lost in the obscurity of history. While in the rest of Greece necromancy was practised in the temples by priests or other religious persons, individuals called *Psychagōgoi* (evokers of spirits) practised it in Thessaly, the native country of magic, and made use of magical practices. In later times these practices became horrible, for magicians, ascribing a superior power to human blood and everything which came from the gibbet or the grave, were led to the most revolting and disgusting acts. They tore men, half-burned, from their funeral piles, buried others living, ripped out unborn babes from the wombs of their mothers, and committed other similar enormities. In case the invoked spirits (and this was the ancient and usual custom) actually presented themselves to the exorcist, necromancy was also called *skiomanteia* and *psychomanteia*, that is, divination by shades (*skiai*) or departed souls (*psychai*). Traces of this mode of divination are also found in the songs of the Scottish bards, especially in Ossian, and in several old German songs. From the first the practice was condemned by the Christian church, and during the middle ages necromancers were persecuted in all ways, imprisoned, tortured, burned. But all this did not succeed in rooting up the popular belief in their powers of divination.

NECROSIS (Greek, literally a state of death), a medical term signifying the death of the bone substance. It is distinguished from *caries*, which is a disease of the bone substance analogous to ulceration in the soft tissues. The part affected by necrosis, like the eschar resulting from the mortification of the soft tissues, has no longer any organic connection with the body, from which it must be separated either by nature or by art. This dead portion, especially when detached from the bone to which it belonged, is called the *sequestrum*. If the necrosis is confined to the superficial layers of the bone substance, the operation of nature by which the dead layers are thrown off is called *exfoliation*. If it is the whole of the outer case of the bone that suffers (and to this case the term necrosis is sometimes restricted), the periosteum or investing membrane sometimes remains healthy, and deposits a lymph which rapidly ossifies and surrounds the diseased part with a healthy crust. The bones that most usually suffer from necrosis are those of the lower extremity, the tibia and femur; but matchmakers were formerly liable to have the lower jaw attacked by it, owing to the noxious fumes of phosphorus employed in the manufacture. The general use of amorphous phosphorus has, however, greatly removed this danger.

NECTAR, in the Grecian mythology, usually the drink of the gods, never given to mortals. In some writers nectar is mentioned as the food of the gods. A sweet wine of Scio, made of half-dried grapes, still bears the same name. The name of nectar is also applied to the sweet juice—a solution of cane and uncrystallizable sugar—which collects in the nectaries or discs of various flowers.

NECTARINE. This fruit seems to differ from the peach only in having a smooth skin, and it is even found occasionally growing upon the same tree. The tree, in its foliage, parts of fructification, wood, and growth, is entirely similar to the peach.

NECTARY, in botany, that part of the flower which yields the honey.

NECTOCALYX. See MEDUSIDÆ.

NEEDLE. Needles were known to the ancients, who ascribed the invention of them to the goddess Bellona; but at first they consisted only of small spikes of wood, fish bones, &c. The Phrygians and Babylonians must have been acquainted with needles, as they were celebrated for their skill in embroidery.

Needle-makers were incorporated at Nürnberg in 1370, and at Augsburg in 1406. The best needles come at present from England, especially Sheffield and Birmingham, where they are made in vast quantities and of all sizes. The first manufacture in England is said to have been established in 1560. Trifling as is the cost of a needle its manufacture is by no means a speedy or simple process. The operations a needle undergoes are so numerous that before it is ready for sale it passes through the hands of more than 120 operatives. The material used in making needles is the best steel, which comes to the manufactory in the form of coils of wire. After the wires have been tested as to quality and thickness the coils are unwound, and in the process of unwinding are made up again into larger coils of an octagonal form, the lengths of wire between the angles of which are as nearly as possible straight. These larger coils are then divided by shears into two exactly equal portions, and these are again cut up into lengths, each somewhat longer than two needles of the size that wire of the diameter used is suitable for making. As these lengths of wire are not quite straight the next thing to be done is to make them so. With this view they are made up in bundles of 5000 or 6000, which are held together by two strong iron rings. The operation by which the wires are straightened is performed on a table on which is fixed a cast-iron plate with two longitudinal grooves of sufficient breadth and depth to receive the rings which bind together the bundles of wires. These bundles are then laid upon the table in such a manner that the rings sink into the grooves and rest upon the table, while the part of the wires between the rings and the parts projecting beyond them rest on the iron plate, and in this position are rolled backwards and forwards a few times under a heavy weight, after which the wires are found to be perfectly straight. The next process is pointing. The wires are taken out of the bundles, and a workman, taking fifty or sixty between his thumb and forefinger, applies them to a revolving grindstone first at one end and then at the other. In this operation, which is called roughing down, no water is used, as that would be sure to rust the needles. Unless proper means are taken to prevent the workman from inhaling the minute particles of steel which fly off during this operation it is very deleterious to the health. One of the most effective machines employed for this purpose consists of an arrangement of bellows by which a powerful current of air is directed against the circumference of the grindstone in such a manner as to carry off all the steel-filings into a conduit, by which they are conveyed out of the building in which the operation is performed. Another means employed to remedy this evil is a kind of magnetic apparatus which is worn by the workman on the mouth, and attracts and collects the dust without allowing it to pass into the lungs. When the pointing is finished the pieces of wire are cut into two, so that each makes two needles. In order that the needles may all be exactly of the same size their points are made to rest during the cutting against one of the raised rims of a small square of metal which has two such rims at right angles to one another, and while they are in this position the shears cut them flush with the opposite edge of the square of metal. The second of the two raised rims is intended to help in resisting the pressure of the shears. The needles have next to get their heads flattened, which is done by a workman who takes from twenty to twenty-five needles in his left hand, lays them out on a steel block, with all the points gathered under his thumb and the heads spread out like the outer margin of a fan, and then strikes each in succession a single smart blow with a hammer. Having been annealed by heating and slow cooling they are then passed on to children, who pierce the heads with a punch, applied first on the one side and then on the other, an operation performed with amazing speed and dexterity. From these they pass to others who trim the eyes by inserting a punch into the holes made by the previous operation, and then laying them sidewise on a block of steel give them a stroke with their hammers first on one side and then on the other, so that the eyes assume the same form as the punch. As many as 4000 needles can be trimmed in this way in an hour by a single child. The next processes are making the grooves at the eyes and rounding the heads. These operations may be done by the hand, the grooves being made by a single stroke of a small file while the needle is held in pincers resting in an angular groove cut in a piece of wood held firmly in a vice, and the heads also rounded and smoothed by a file. In most English factories, however, these two operations are performed at once by a machine devised for the purpose. In this machine there are two dies of tempered steel bearing in relief the form to be impressed on the head of the needle. One of these is fixed on the table of the machine; the other is attached to a ram, which may be raised and let down by a pedal lever, which may be worked by a child. As it is raised the head of the needle is inserted between the two dies, and by its descent it finishes the head of the needle at a single blow. The needles are now hardened by being first spread out on a plate of sheet-iron and heated to a proper degree in a furnace or a molten lead-bath, and then plunged into cold water. After this process they are very hard and brittle, and require to be tempered. One mode of doing this is to put them into a sort of frying-pan containing a certain quantity of fatty matter, and then placing the pan over a fire and keeping it there till the fatty matter inflames and burns out, when the needles are found to be satisfactorily tempered. After these processes the needles must be straightened again, as they are apt to become twisted while undergoing them. The next process to which needles are subjected is that of polishing, which is by far the longest of them all. To undergo this process about 500,000 needles, all lying in one direction, mixed with some gritty matter, such as quartzose sand or emery, to which is added a certain quantity of rape-seed oil, are made up into a bundle, with a canvas wrapper tied round with string. The bundle is about 12 inches long, and tapers towards both ends. From twenty to thirty of these bundles are laid at one time upon a table or platform, which moves backwards and forwards upon rollers. Above the bundles of needles are several broad and heavy pieces of wood, which are together nearly equal in extent to the movable table, but which are not, like it, capable of being moved horizontally, but only of being raised separately so as to allow of the admission of the bundles for polishing. When all these pieces of wood are let down they form a uniform surface on the under side parallel to the upper surface of the movable table. The bundles between lie in a direction at right angles to the motion of the movable table, and by its motion they are made to turn on their axis under the pressure of the wooden blocks lying on the top; and by the motion and pressure combined the needles in the bundles are gradually polished through the friction with the smeared sand or emery. The lower table moves about twenty times forwards and twenty times backwards per minute, and the whole operation lasts from eighteen to twenty hours. After this the needles are taken out of the bundles and put into bowls with saw-dust to free them from the grease

and particles of sand which adhere to them, which is done still more effectually in the next operation, in which they are scoured by being put into a revolving cask containing more saw-dust. They are afterwards freed from the saw-dust by winnowing. The preceding operations, beginning with the making up of the bundles for polishing, are repeated ten times for the best quality of needles, the only difference being that in making up the bundles the material used to mix with the needles is changed at certain stages of the operation, bran being generally made use of at the last stage. Sometimes soap-suds are used in the scouring process. After being wiped individually with a linen rag or soft leather the needles are sorted, which is done by inclosing from 2000 to 3000 in an iron ring with all their heads in one plane, and abstracting from the bundle, by means of a kind of hook made for the purpose, all those needles which have defective points, which are sent to be repointed, and afterwards make needles of inferior value. The needles which are found perfect are then arranged exactly according to their length. Those which have become bent in the polishing are first straightened. They are next weighed out by hundreds and made up in packets. They have still one operation to undergo before they are ready for sale, the operation called bluing, which consists in giving a longitudinal polish to the points, by which they receive at the same time a bluish cast. For this purpose the packets of needles are sent to the bluer, who, taking about twenty-five of them between his fore-finger and thumb, applies their points to a small hone-stone of micaceous schist with angular edges revolving in a lathe, and during the application turns them round rapidly on their axis. The angular edges of the hone-stone act like files. (Ure's Dictionary of Arts, Manufactures, and Mines.)

NEEDLE-GUN. See MUSKET.

NEEDLE-ORE. This mineral, which is also called *aciculite*, is a sulphide of bismuth, lead, and copper; it occurs in Siberia accompanied with gold.

NEEDLES, THE, a cluster of remarkable rocks in the English Channel, off the west extremity of the Isle of Wight. They owe their name to their pyramidal and pointed shape, are composed of white chalk varied by black alternating streaks of flint, and are continually yielding to the action of the waves. Only three of them now stand boldly out of the water, one which was above 100 feet in height, and best deserved the name of needle, having fallen in 1764, and almost entirely disappeared. They have probably originated in a landslip, and been washed into their present shape by the action of the sea. The Needles light, on the edge of the cliff at the west extremity of the isle, is 715 feet above the level of the sea.

NEERWINDEN, a village in the province of Liége, Kingdom of Belgium, 16 miles from Louvain. On the 19th (29th, N.S.) of July, 1693, the Marshal of Luxembourg gained a victory here over the allies under William III., king of Britain. On the 18th of March, 1793, the French, under Dumouriez, were defeated here by the Austrians, in consequence of which the Prince of Coburg again became master of the Belgian provinces.

NE EXEAT REGNO, in English law, a writ prohibiting the person against whom it is directed from leaving the kingdom. It may be obtained by a creditor who is afraid of losing the sum due to him through the escape of the debtor, or by a wife who has been awarded alimony in the court of divorce, and whose former husband shows an intention of leaving the kingdom without paying. The original object of the writ was to prevent the clergy from leaving the country without royal license. The writ, in the few cases in which it is now granted, must as a rule be prayed for by a bill; but if the defendant's intention of leaving the country becomes manifest while a suit is pending the writ may be granted at once. The writ is delivered to the sheriff of the county where the defendant is, and empowers the sheriff to arrest him, yet without breaking open outer doors. The defendant, when arrested, may obtain his enlargement by depositing the amount of the debt with the sheriff, or by executing a bond in double the sum conditioned not to quit the country without the leave of the court. Similar writs under the title of *Ne Exeat Republica* are issued, though rarely, in the United States.

NEGATIVE EYE-PIECE, a form of eye-piece much used in telescopes and microscopes. (See these articles.) It consists of two glasses, both plano-convex. The plane surfaces are turned towards the eye; the distance between the glasses is half the sum of their focal lengths; the focal length of the field-lens is three times that of the eye-lens. As the focus of the combination is between the glasses, this eye-piece is badly adapted for use with micrometers.

NEGRITOS, or NEGRILLOS, the name given by the Spaniards to an aboriginal race in the Philippine Islands, and literally signifying small negroes. They resemble negroes in most of their features, but are of very small stature, seldom reaching more than 4 feet 8 inches in height. The colour of their eyes, which are peculiarly brilliant, inclines to yellow. The hair is curly, but not so dense as that of the negroes, growing in woolly locks of considerable length. The lips are not so thick as those of the negroes. In youth they are generally sufficiently well made, but as they grow older their appearance becomes less agreeable. This is no doubt due to their mode of life. They have no regular dwellings, and lie down wherever the night happens to overtake them, finding shelter in the hollow of a tree or under a temporary structure loosely made of bast. They live by hunting, and in this they acquire a wonderful degree of bodily agility. They are extremely restless, continually moving about from place to place in companies of from fifty to sixty. By the Malays who live on the Philippine Islands they are called Aieta or Ita. Their number is estimated at 25,000. They are found chiefly in the interior of the island of Luzon, and on the island of Negros, which is called after them. There is another much more numerous race in the Philippine Islands that is frequently confounded with the Negritos, from the fact that they are both designated by the Spaniards Infieles, that is, infidels. This race includes the Igorrote, Buriks, Tingianes or Itanegs, and various other tribes, who differ from the Negritos proper in being of greater height and less negro-like in appearance, and also in being considerably more civilized.

NEGRO (Latin, *niger*, black). This race of the human species belongs to the *Ulotrichous* division of ethnology, that is, to the primary division of mankind, characterized by the possession of hair of a woolly or crisp nature. The hair and eyes of this section are normally of dark colour, and, as well exemplified by members of the negroid stock, the skull has a *dolichocephalic* or 'long-headed' conformation, that is, the skull exhibits a long antero-posterior diameter. The Negro race is further distinguished by the *prognathous* character or forward inclination of the jaws; whilst the development of the black colour in the skin is carried to its fullest extent in this stock. In many instances the terms 'Negro' and 'African' have been employed synonymously in connection with the subject of ethnology; but, as pointed out by Dr. Latham in his Natural History of the Varieties of Man, this use of such phraseology is erroneous. 'The

true Negro area,' says Latham, 'the area occupied by men of the black skin, thick lips, and woolly hair, is exceedingly small; as small in proportion to the rest of the continent (of Africa), as the area of the district of the stunted Hyperboreans is in Asia, or that of the Lapps in Europe.' The Negro or Ethiopian race is generally regarded as comprising the nations of Africa south of the Atlas range of mountains. But included in such an area are many tribes, or races, such as Hottentots and Bushmen, which exhibit characters essentially distinct from those of the typical Negro, which, briefly stated, consist in the prognathous dolichocephalic skull, with small nose, thick lips, woolly hair of black colour, jet-black skin, with oily or unctuous secretion, and bent or crooked legs. These characters are typically met with in an area on the western side of Africa, which includes within its limits the Senegal, Gambian, and Niger valleys, with a portion of more central territory extending eastward towards the valleys of the Upper Nile. The language of the Negro races appears to be of Semitic type, whilst their derivation from Semitic stock is indicated by common features in superstitions and customs. The colour of the Negro skin exists, like that of other coloured races, in the epidermis or outer skin, and in the upper layer of the true skin. What is known as *albinoism*, or the absence of colour cells in the progeny of the Negro, or other coloured race, occasionally manifests itself in the Negro. As regards the degree of intelligence and of civilization manifested by the Negro races, these appear to vary according to the influences exerted upon them by the civilized nations with which they come in contact. The Negro, as a rule, is shrewd, intelligent, and apt; but the standard of education and intelligence attainable by the members of the race, under the most favourable circumstances, is by no means so high as might be expected. In the social life of civilization, and as regards domestic affairs and affections, the Negro ranks on an equality with stocks of higher or more elevated type. He is faithful to his trust, is hospitable, fond of music, and simple in his tastes. In his rudest state superstition and pagan rites take the place of religious teachings; whilst in war the Negro may evince a ferocity and blind courage of an extraordinary kind. Altogether the Negro race presents an average status, under favouring circumstances, of educational, social, and religious excellence; and, in any case, the race appears exceedingly susceptible of civilizing influences.

NEGRO (Black), the name of numerous rivers, both large and small, in South America, one in Cuba, and one in Central America. Of these the most important are—1. A river, also called *Casu*, which throughout its whole length forms the boundary between the Republic of La Plata and Patagonia. After a direct course of about 600 miles it falls into the Atlantic north of the Gulf of St. Matias, about lat. 41° s., and lon. 63° w. Towards its mouth it is above 500 yards wide, with a still current, but its navigation is seriously impeded by a bar at its mouth with not more than 6 feet at low water. The river was ascended nearly to its sources in 1778 by a Spaniard named Villarino.—2. One of the largest tributaries of the Amazon, also called *Guania*. It has its sources in New Granada, but its course, estimated at about 1000 miles, is chiefly in Brazil. In its upper part it communicates with the Orinoco by the natural canal of Cassiquiari; in its lower part it forms a succession of lakes, sometimes widening out in the rainy season to 15 or 20 miles. Between its lowest level in March and its highest in August there is a difference of about 30 feet. At its mouth, which is about lat. 3° 15′ s., and lon. 59° w., it is about 1½ mile wide.—3. A river which rises in the north-east frontier of Uruguay, flows generally south-west and west, and after a course of about 300 miles falls into the Uruguay near lat. 33° 30′ s., and lon. 58° 30′ w. It owes its name to the discoloration of its water by the large quantity of sarsaparilla which grows upon its banks, and is even said to impart to it medicinal virtues. Its navigation is much obstructed by cataracts.

NEGROPONT, a name frequently applied to the island of Eubœa (now pronounced *Évĕa*), the largest and most fruitful island in the Kingdom of Greece, in the Ægean Sea, separated from the mainland on the north by the channel of Trikeri, and on the west by a narrow arm of the sea, called in its northern portion the channel of Talanta, and in the southern part Egripo (anciently *Euripus*). The name of Egripo is also applied by the common people to the whole island, and it is from this name that the originally Italian corruption of Negropont (Negroponte) has arisen. At the narrowest part this strait is not more than 200 feet broad. It has there been crossed by a bridge since 410 B.C. The length of the island is 205 miles, and the breadth from about 5 to 32 miles; area, 1340 square miles. The island is almost entirely mountainous. The mountains, which are chiefly of limestone, divide themselves into three groups. In the northernmost the highest peaks are Xeron and Kandili, each about 3000 feet high; in the middle group the highest is Delphi, 5370 feet high; and in the southernmost, Mount Ocha or St. Elias, 4322 feet high. The island contains extensive beds of marble, for example, the bluish green marble of Karystos, which was famous in ancient times. Near Kumi on the east coast is a layer of brown coal; and in the north, near Ædepsos, are medicinal hot-springs. Dense forests of fir cover the sides of the mountains of the northern part of the island; in the middle are chestnuts; but the southern part of the island is almost bare. The climate is healthy. The chief products are cotton, oil, wine, wheat, fruit, silk, and honey. The inhabitants in the earliest times were Thessalian Histiæi in the north, Abantes and Kuretes in the middle, and Dryopes in the south. Afterwards the island, especially in the middle and north, was colonized from Attica, and the inhabitants were reckoned as Ionians. The government of the island was in the earliest times monarchical, but afterwards became republican. The chief towns became independent, and some of them, especially Chalcis and Eretria, in course of time, attained a high degree of importance, and founded colonies in Southern Italy, on the island of Sicily, and on the Thracian Peninsula, which took from Chalcis the name of Chalcidice. The whole island was made subject to the Athenians by Pericles. It was afterwards subdued by Philip of Macedonia, and after the fall of the Macedonian rule became, although only in name, once more a free state, until it was incorporated by Vespasian with the province of Achaia. It next became a part of the Byzantine Empire, and in 1204 was conquered by the Venetians, in whose possession it remained till 1470, when the Venetians were expelled by the Turks, to whom it remained subject till the Greek war of independence. It now forms with the islands of Skyros, Skiathos, Skopelos, and Halonesos, a nomarchy of the Kingdom of Greece, divided into the four eparchies of Chalkis, Xerochori, Karystia, and Skopelos. The capital is Chalkis or Egripo, at the narrowest part of the channel separating the island from the mainland. Pop. (1879), 95,136.

NEGROS, an island and province in the Asiatic Archipelago, belonging to the Philippines, and separated by narrow channels from Panay on the north-west, and Zebu on the south-east; length, 130 miles; average breadth, about 25 miles; area, 3782 square

miles. The west coast is sandy and safe; the east is rendered dangerous by strong currents. A range of lofty mountains, with apparently volcanic peaks, stretches from north to south, and furnishes the sources of numerous streams. The interior is little known. Earthquakes are frequent, but the climate is healthy. On the coast, where the natives are tolerably civilized, rice, cacao, and tobacco are cultivated. Pop., exclusive of uncivilized tribes, 50,000.

NEGUS, a drink made of wine, water, sugar, nutmeg, and lemon-juice; so called from Colonel Negus, the inventor.

NEHEMIAH, a distinguished and pious Jew, who was born in captivity, but was made the cup-bearer of Artaxerxes Longimanus. He used his influence for the welfare of his unhappy countrymen, and became their benefactor At his own request he was sent, B.C. 444, as governor to Jerusalem, with a commission to rebuild the walls and gates of this city. He accomplished his purpose, but not without difficulties, arising partly from the poverty of the lower classes of the people, and partly from the opposition of the Moabites and Ammonites. He then took measures to raise the city to its former splendour, and to increase its population. In 432 he returned to Persia, but some time after paid a second visit to Jerusalem in order to put an end to certain abuses that had crept in during his absence. He and Ezra were the proper founders of the Jewish liturgy, and a collection of the holy books was made under their inspection. Nehemiah published an account of the same in a book which is admitted into the Jewish canon, and forms a supplement to the narration contained in the book of Ezra. It includes a period of forty-nine years.

NEIDHART VON NEUENTHAL, a German lyric poet of the middle ages, a native of Bavaria, but afterwards resident in Austria. He flourished between 1210 and 1240, and gave a new character to the lyric poetry of the period, inasmuch as he drew his materials from native sources and in the form of his versification followed native models. He wrote for the higher ranks, but the subjects of his lyrics are usually taken from peasant life, and are treated with a peculiar humour and often with great boldness and freedom. Down to the fifteenth century many coarse songs were falsely attributed to him, and all sorts of rough practical jokes and adventures with peasants when related in a lyric form were very commonly known simply as *Neidharte*. The best edition of his songs is that of Haupt (Leipzig, 1858).

NEILGHERRY (more correctly NILGIRI) HILLS, a mass of mountains in South Hindustan, partly in the province of Coimbator, about lat. 11° 10′ N., at the south extremity of the East and West Ghauts, and as it were a connecting link between them, extending east to west about 34 miles, and north to south about 15 miles; culminating point, 9941 feet high. They form a plateau, have peaks 5000 to 8800 feet high, and several stations, resorted to by Europeans for the salubrity of the climate. The higher parts are often frosty even in summer, and in winter they are covered with snow. Lower down the surface is a fine pasture, like much of our downs, and the wild fruits of our own country are found in abundance. The deeper valleys are occasionally narrow and marshy; but the usual character of the less elevated portion is like the south of Europe.

NEISSE, a town in Prussia, in the province of Silesia and the government of Oppeln, on a river of same name, 47 miles S.S.E. of Breslau, with which it is connected by railway. It is a place of considerable strength, being surrounded by walls and otherwise fortified, and has manufactures of firearms, powder-mills, and a trade in worsted and in building-stone, extensively quarried in the neighbourhood. It came into the possession of Prussia in 1741, when, after a valiant defence, it was taken by Frederick II. Pop. (1880), 20,507.

NEITH, or NEITHA, an Egyptian goddess who was worshipped especially as a local divinity at Saïs in Lower Egypt, and hence in the Egyptian hieroglyphics frequently bears the designation 'Mistress of Saïs.' By the Greeks she was identified with Athēnē. She often appears as the companion of Phtha, who, as local divinity of the old capital of Memphis, stood at the head of the pantheon of Lower Egypt; and on that account she is not unfrequently styled the great Mother of the Gods. Like all the great Egyptian goddesses, she was identified with Isis. At Saïs a festival was annually celebrated in her honour, at which innumerable lamps were burned the whole night, whence it was called the Lamp Festival. Plutarch and Proclus state that her temple at Saïs bore the inscription:—'I am all that has been, that is, and that will be; and no man hath ever lifted my veil. The sun was my child.'

NEJD, or NEJED (Arabic, elevated country), the general name of the central part of Arabia, forming a portion of the Wahabi Empire, and divided into the five provinces of Sedeir, Woshem, Aared, Aflaj, and Yemama, and in great part covered by the heights of Jebel Tuweik. Towards the south this region borders on the great sandy desert of Dahna, and arms of this waste separate it on the east from the coast district El-Hasa, on the north-west from Jebel Shomer and the province of Kasim. Its general character is that of an elevated plateau with rocks rising precipitously from its surface. It is intersected by a labyrinth of valleys and water-courses, most of which latter are dry, except in the rainy season, while none of them reach the sea. The higher grounds are covered for a great part of the year with good grass; the valleys have a fertile soil, with towns and villages inhabited by the settled population, while the desert portions are inhabited by the tribes of Bedouins. Rain falls in the north from November to February, but the summers are excessively dry. The climate is very healthy, the inhabitants well and strongly built. The more elevated districts of Nejd feed immense droves of camels and the best breeds of Arab horses. The camels are annually supplied in thousands for the use of the Syrian caravans, and though not so large and strong as those of Egypt, are swift and handsome. The horses, remarkable for speed, symmetry, and bottom, are exported to India. Its chief town is Riad (28,000 inhabitants), the Wahabi capital, and the centre of Mohammedan orthodoxy and fanaticism. Most of our information regarding Nejd was contributed by Palgrave, who travelled through Central and Eastern Arabia in 1862–63 (Narrative of a Year's Journey through Central and Eastern Arabia, London, 1865). Riad was also visited by Lieutenant-colonel Pelly in 1864. The name Nejd is sometimes applied to the whole Wahabi dominions.

NEJIN, or NIEJIN, a town in Russia, in the government of Czernigov, and 36 miles south-east of the town of Czernigov, on the left bank of the Oster. It is surrounded by an earthen rampart, defended by a castle, and manufactures silk, soap, leather, and perfumes, famous confectionery and liqueurs, and carries on a considerable trade between Danzig and Leipzig on the one hand, and Moldavia, Walachia, and the Crimea on the other. Pop. 21,590.

NELATON, AUGUSTE, a noted French physician and surgeon, born June 17, 1807; died at Paris September 21, 1873. He studied medicine at Paris under Dupuytren, and graduated as Doctor in December, 1836. Soon after he was appointed hospital surgeon and private lecturer in the faculty of medicine in the

University of Paris. In 1851 he was appointed professor of clinical surgery, an office which he continued to hold till 1867, when he retired with the title of honorary professor. In 1866 he had been appointed ordinary surgeon to the emperor. By a degree of 14th August, 1868, he was raised to the dignity of senator. Nelaton was equally distinguished as a professor and as an operator. He was specially renowned for his skill in operating for the removal of calculus, and was the inventor of a new method of operating in this disease. Among his published works are Traité des tumeurs de la mamelle (Paris, 1839); Parallèle des divers modes opératoires dans le traitement de la cataracte (1850); De l'influence de la position dans les maladies chirurgicales (1851); and Éléments de pathologie chirurgicale (Paris, five vols. 1844–60; 2d edition, vols. i.–iii. 1867–70), a work of great value, in which several of his pupils took part.

NELLOR, a town in India, in the Presidency of Madras, capital of the district, on the right bank of the Ponnar, near its mouth in the Bay of Bengal, 92 miles north by west of Madras. An anicut, or dam, constructed for purposes of irrigation, here interrupts the course of the river. Nellor was ceded in 1801 by the Nabob of Arcot. Pop. about 24,000.

NELSON, a provincial district in New Zealand, in the north-west of Middle Island. Its extreme length is 160 miles; extreme breadth, 116 miles; area, 10,468 square miles. Although agriculture is now carried on to a considerable extent in several districts, still the great wealth of the district lies in its minerals. Unlimited beds of excellent iron ore, lead and copper ores, coal, and gold, both alluvial and quartz, are met with in spots highly favourable for working, and coal and ironstone are already worked near Collingwood on Massacre Bay on the north coast. Pop. (1881), 26,075.

NELSON, a town in New Zealand, capital of the provincial district of the same name, finely situated at the south-east of Tasman or Blind Bay. Steamers ply regularly to the neighbouring ports and to Melbourne, and occasionally to Sydney. The manufactures are cloth and leather. A railway now runs 23 miles inland from Nelson. Pop. in 1881, 6764; with suburbs, about 10,000.

NELSON, Horatio, a celebrated naval officer, who was born September 29, 1758, at Burnham Thorpe, in Norfolk, of which parish his father was rector. At the age of twelve he entered the navy as a midshipman, and in 1773 accompanied Commodore Phipps in an expedition towards the north pole. In 1777 he was made a lieutenant, and in 1779 raised to the rank of post-captain. He distinguished himself in an attack on Fort Juan, in the Gulf of Mexico, and on other occasions, and remained on the American station till the conclusion of peace. He afterwards commanded the *Boreas* frigate, and was employed to protect the trade of the Leeward Islands. While serving on this station he made the acquaintance of Mrs. Nesbit, whom he married in 1787. On the commencement of the war with the French Republic he was made commander of the *Agamemnon*, of sixty-four guns (1793), with which he joined Lord Hood in the Mediterranean, and assisted at the siege of Bastia (May, 1794). At the siege of Calvi (July 10, 1794) he lost an eye. In the battle of Cape St. Vincent, February 14, 1797, he commanded the *Captain*, on board of which he attacked the *Santissima Trinidada*, of 136 guns; and passing to the *San Nicholas*, of eighty guns, and the *San Joseph*, of 112, he obliged both those ships to strike their flags. For his gallantry he was made rear-admiral of the blue, and appointed to the command of the inner squadron at the blockade of Cadiz. His next service was an attack on the town of Santa Cruz, in the Island of Teneriffe, in which he was unsuccessful; and being severely wounded, his life was saved by his step-son, Captain Nesbit, who at great personal hazard conveyed him to a boat. He was obliged to suffer the amputation of his right arm. Although unsuccessful on this occasion, the bravery of his conduct was fully appreciated in England, and he was rewarded with the order of the Bath and a pension of £1000 a year. In 1798 he joined Lord St. Vincent (Admiral Jervis), who sent him to the Mediterranean to watch the progress of the armament at Toulon. Notwithstanding his vigilance, the French fleet which conveyed Bonaparte to Egypt escaped. Thither Nelson followed, and after various disappointments he discovered the enemy's fleet moored in the Bay of Aboukir. Having, by a well-executed manœuvre, obliged them to come to action, he obtained a most complete victory, all the French ships but two being taken or destroyed (August 1, 1798). This achievement was rewarded with the title of *Baron Nelson of the Nile* and a pension of £2000, besides the honours conferred on him by the Sultan of Turkey. His next service was the restoration of the King of Naples, which was accompanied with circumstances of revolting cruelty, which may be attributed to the influence of Lady Hamilton (which see), the wife of the English ambassador. His connection with that lady, with whom he lived publicly after the death of her husband, occasioned his separation from Lady Nelson on his return to England. In 1801 he was employed on the expedition to Copenhagen under Sir Hyde Parker, in which he displayed his accustomed gallantry, and effected the destruction of the Danish ships and batteries. On his return home he was created a viscount, and his honours were made hereditary in his family, even in the female line. When hostilities recommenced after the Peace of Amiens Lord Nelson was appointed to command the fleet in the Mediterranean, and for nearly two years he was engaged in the blockade of Toulon. In spite of his vigilance the French fleet got out of port (March 30, 1805), and being joined by a Spanish squadron from Cadiz, sailed to the West Indies. The British admiral hastily pursued them, and they returned to Europe, and took shelter at Cadiz. On the 19th of October the French, commanded by Villeneuve, and the Spaniards by Gravina, ventured again from Cadiz, and on the 21st they came up with the British squadron off Cape Trafalgar. An engagement took place, in which the victory was obtained by the British at the expense of the life of their commander, who was wounded in the back by a musket-ball, and shortly after expired. His remains were carried to England, and after lying in state at Greenwich he was magnificently interred in St. Paul's Cathedral, where a monument was erected to his memory. Having left no issue by his wife, an earldom was bestowed on his brother, and a sum of money voted by Parliament for the purchase of an estate, which is to descend with the title to his collateral relatives. His life has been written by Mr. M'Arthur, Dr. J. Stanier Clarke, Dr. Southey, and Sir H. Nicholas.

NELUMBIACEÆ (the Water-bean order), an order of aquatic plants bearing a resemblance to water-lilies, but distinguished from them by the entire absence of albumen in their embryo, and their enlarged tabular torus, in the hollow of which the nuts are half-buried, and finally become loose. The plants are herbs, with peltate, fleshy, floating leaves arising from a prostrate trunk, growing in quiet waters. They have large showy flowers with numerous stamens. They are diffused in the temperate and tropical regions of the southern hemisphere, but abound most in the East Indies. Most of the species

are remarkable for the beauty of their flowers. The best known is *Nelumbium speciosum*, the flower of which is believed to be the mythic lotus so frequent on the monuments of Egypt and India, and the nut to be the Egyptian bean of Pythagoras. The nuts of all the species are edible and wholesome, and most of the other parts are applied to economical purposes. The rhizome or creeping stem is eaten by the Chinese, and the tender shoots between the joints of the roots are used by the natives of India either boiled or in curries. *Nelumbium luteum*, the yellow water-bean, has starchy rhizomes, with tubers like those of the sweet-potato, which are used for food. The milky viscid juice of the leaf-stalks, flower-stalks, and petals is slightly astringent. The spiral vessels in which the leaf and flower stalks abound are carefully extracted by the Hindus, and used as wicks to the lamps which are burned on great and solemn occasions before the shrines of their gods.

NEMATELMIA, the division of *Scolecida* that includes those parasitic worms which possess bodies of rounded or cylindrical shape (Greek, *nema*, thread; *helmins*, a worm). No distinct segmentation or division of the body is observable, and locomotive appendages are not usually developed. Most of these forms are hermaphrodite. In this division are included the *Acanthocephala*, or 'Thorn-headed' Worms, of which the *Echinorhynchus gigas*, averaging 18 inches in length, found as a parasite in the alimentary canal of the pig, may be selected as a good example. Other members of this group inhabit fishes and birds. These forms are parasitic during their entire existence. No mouth or digestive system is represented. The protrusible proboscis is provided with hooked processes disposed in four circlets, and of recurved shape; and by means of this apparatus the Echinorhynchus adheres to the intestinal walls of its host. An embryo provided with hooked processes appears to be first produced in the course of development, and within this embryonic body that of the true worm is in due course formed. The *Gordiacea*, or 'Hair-worms,' constitute the second division of the Nematelmia. These worms possess slender hair-like bodies, and are found as parasites in the interior of beetles and other insects, during the first stages in their development at least. A distinct mouth is present, and a digestive system exists; but no anal opening has been demonstrated. The sexes are situated in different individuals. These worms on arriving at sexual maturity escape from the bodies of their hosts, and seek the water of pools, in which the eggs are deposited in the form of lengthened chains. The embryos produced from these ova are provided with a retractile proboscis and hooks, by means of which they penetrate the bodies of insects, and there develop into the sexually mature worms. In some cases, the worm measures many times the length of the unfortunate insect in whose body it lies buried. From a beetle measuring only an inch in length, one of the Gordiaceæ was taken which measured 11 inches. Others exceed 3 feet in length. The popular name of 'hair-worms' was given to these animals from their presenting a resemblance to hairs; and superstition formerly credited horse-hairs, introduced into water, with the remarkable property of becoming transformed into these living creatures. The *Gordius aquaticus* is a familiar species, and the genus *Mermis* is another example of the order. Immense numbers of these worms occasionally appear in fresh-water pools, and such appearances receive accordingly the name of 'worm-showers.' The last order of the Nematelmia is that of the *Nematoda*, which includes several familiar and notable forms, of which the most celebrated are the *Ascaris*, or common 'Round-worm' of the human intestines; the *Trichina*, now famous for its fatal effects in man; the *Oxyuris*, or 'Small Thread-worm;' the *Filaria*, or 'Guinea-worm;' and the *Anguillulidæ*, or so-called 'Vinegar-eels.' The Nematoda, although mostly parasitic, also comprise many free and non-parasitic forms; a distinct mouth, digestive canal, and anus, are present; and a water-vascular system of canals is also to be recognized. The sexes are situated in different individuals. The nervous system consists of an anterior ring surrounding the gullet, and from this, as a centre, nerves are supplied to the other parts of the body. The males are smaller than the female animals. The *Ascaris lumbricoides* inhabits the intestinal tube of man. The *A. nigrovenosa* inhabits the lungs of the frog, and the young of this form appear alternately to exist in a free and in a parasitic condition. Thus the first generation may be resident parasitically within the pulmonary tissues of the frog; and the forms produced from the ova of this first generation develop externally to the frog's body, and become sexually perfect and mature ascarides, and live in a free state. The ova produced in turn by these latter forms give origin to individuals which can only become mature by gaining access to the body of a frog, thus repeating by alternation the parasitic condition of the first generation. The *parasitic* forms of *A. nigrovenosa* which have hitherto been discovered are invariably females; and hence by some observers it has been maintained that the ova of these parasitic forms are produced by *parthenogenesis* (which see), that is, without the sexual co-operation of male animals. The *Oxyuris vermicularis*, or 'Thread-worm,' infests the rectum or lower bowel of children particularly, and gives rise to distressing symptoms, chief of which is an intolerable itching. Its length averages a quarter of an inch; and occasionally they cause irritation from their presence in large numbers. The *Trichina spiralis*, in its imperfect condition, inhabits the muscles of the pig, each worm being coiled up within a little cyst, or envelope, which may undergo calcareous degeneration. In this state it is incapable of further change, but if the flesh of the pig be eaten, say by man, the worms become liberated from these cysts, develop sexual organs, and produce enormous numbers of young in a very short space of time. Now ensues the danger, for these young Trichinæ, produced thus within the human alimentary canal, bore their way through the tissues to find a resting-place among the muscles, and to become encysted like their parents. The irritation consequent on this migration of these forms is sometimes so great, that the person so afflicted succumbs and dies. Once encysted in the muscles, however, these new Trichinæ, like their predecessors of the pig, can undergo no further development, unless, indeed, the flesh of the infested person, or of the other warm-blooded vertebrate in which they were contained, be eaten by another animal, when the same series of phenomena would be repeated in the history of this second host. Many persons have died on the Continent, especially of late years, from the irritation produced by the Trichinæ; and in the muscles of dissecting-room subjects the little capsules are frequently met with. The pectoral or breast muscles form a favourite site for these immature or encysted Trichinæ. The Guinea-worm (*Filaria medinensis*) of Africa and India attains a length of many feet, and infests the cellular tissue of the leg and feet, burrowing beneath the skin, and causing much irritation. These worms are invariably females, and the young forms appear to fix on the bodies of bathers. The worm appears to burrow to the surface of the body, sooner or later, to discharge the embryos, which at first appear as hair-like bodies, and which seek the water, where they are known as 'Tank-worms.' (See GUINEA-WORM.) The *Anguil-*

Iulidæ, or 'Vinegar-eels,' and their allies, include the *Anguillula aceti*, found in vinegar, and numerous other forms which inhabit both salt and fresh water. The *Vibrio tritici*, causing, by its presence on wheat-ears, the disease known as 'ear-cockle,' or 'purple,' is also included in this latter family, which therefore comprises free or non-parasitic Nematoda.

NEMEAN GAMES, so called from the valley of Nemea in Argolis, where they were celebrated, originated, according to tradition, in the funeral games which were established in honour of Opheltes (see HYPSIPYLE), who was killed in his youth by a dragon. The heroes who went to Thebes called him *Archemorus* (the beginning of sorrow). He was the son of Lycurgus, king of Nemea, and Eurydice. Funeral games at the graves of distinguished men or favourite individuals were very common in ancient times. Those of Opheltes, according to tradition, had this peculiarity, that they were renewed every three years. Another account relates that the Nemean Games were established in honour of Zeus by Heracles after he had destroyed the Nemean lion, whose den was about 15 stadia from Nemea. A third account combines these two reports, stating that these games originated in the funeral games of Archemorus, but were renewed by Heracles in honour of Zeus. The Nemean valley is now quite uninhabited. Three Doric columns of the temple of Zeus still stand in the centre of the plain of Nemea, with ruins scattered around. The Nemean Games were less solemn than the Olympic and Pythian, but were celebrated more frequently, namely, once every second year, in the winter of every second and the summer of every fourth year of each olympiad. Sometimes, though not very often, time was divided by nemeads (in the same manner as it was commonly divided by olympiads and pythiads). The Nemean Games were at first exclusively martial, only soldiers and the sons of soldiers being allowed to take part in them; but afterwards they became as general in their character as the other three great festivals of Greece, and no restrictions were placed upon the competitors except that they should be of Greek nationality. The direction of these games was originally in the hands of the people of Cleonæ, a small town near the spot at which they were held, in whose territory the Nemean valley lay; but in 573 B.C. it was wrested from them by the people of Argos, who kept it ever after except for a few short intervals. They accordingly nominated the judges of the combats (*agonothetæ*), twelve in number, who wore, in commemoration of the origin of the celebration, black mourning garments. They were distinguished for their impartiality. Originally the reward of the victor was a wreath of olive-branches, afterwards of green parsley. See PINDAR.

NEMERTIDA, a group or suborder of the *Planaridan* order of Scolecida (Annuloida), represented by the 'Ribbon-worms' found on the sea-coasts of various countries. They possess flat, ribbon-like bodies, which, as in the *Borlasia* of the British coasts, may attain a length of more than 15 feet. The surface of the body is richly ciliated. A ciliated mouth exists, and a protrusible proboscis is present. The gullet is provided with a *spiculum* or dagger-like weapon, by means of which these worms seize or kill their prey. An intestine and anus are present, and a water-vascular system is developed, which, however, does not communicate externally by any visible aperture. A circulatory system of vessels also appears to be represented in addition to the water-vascular apparatus. The larva of these forms was termed *Pilidium* by J. Müller, and was described as being 'helmet-shaped.' From this primitive embryo the adult worm is gradually evolved, and the latter finally leaves the *Pilidium* on completing its development. Reproduction may also be effected by fission or division of the body, or by means of internal budding or gemmation. The genera *Nemertes* and *Borlasii* exemplify this suborder. The *Nemertes* met with around our coasts is said occasionally to attain the enormous length of 10 fathoms or even more.

NEMESIS, in the Greek mythology, according to some, the daughter of Erebus and Night; according to others, of Night alone. Other accounts make her the daughter of Dikē (Justice), or of Zeus and Necessity, or of Ocean and Night. She is the goddess of retribution, the tamer of the passions, the avenger, the enemy of pride and haughtiness; and she watches over the observance of the honours due to the dead, on which account a yearly festival in memory of the departed was called by the Greeks *Nemesia*. Nemesis is represented under the figure of a majestic female clothed in a tunic, with a *peplum* thrown over her, and a crown (which is sometimes surrounded by stags and a Victory) on her head. With the right hand she grasps a part of her garments over her breast; in her left hand she holds a cup, or a bridle, &c. On coins she appears drawn in a car by dragons, sometimes wearing a mural crown, and rarely winged. The great number of coins and gems on which she is found proves her worship to have been extensive and popular. She is also called *Adrasteia*, from *Adrastos*, who, according to tradition, erected the first temple to her on the banks of the Asopus; and *Rhamnusia*, from a small village of Attica, 2 miles from Marathon, where stood a statue of her made by Phidias from the marble brought thither by the Persians for the purpose of erecting a trophy of their expected victory.

NEMI, a lake in Italy, about 17 miles south of Rome. It is evidently the crater of an extinct volcano, the sides of which are formed partly of basalt and partly of consolidated scoriæ. It stands 1022 feet above the level of the sea, and has a circuit of 5 miles. It is of great beauty, and is much celebrated by the Latin poets under the name of Lacus Nemorensis or Speculum Dianæ (Diana's Mirror).

NEMOURS, a French town in the department of Seine-et-Marne, 10 miles south of Fontainebleau. The old castle of Nemours, built in the twelfth century, is memorable on account of the edict revoking the privileges of the Huguenots, signed here by Henry III., July 7, 1585. Pop. 4010.

Nemours, with the surrounding territory, was erected into a duchy in favour of the Count of Evreux in 1404. In 1425 the lands of the duchy passed by marriage to the younger branch of the house of Armagnac, and in 1461 or 1462 Louis XI. revived the title in favour of Jacques d'Armagnac, who was, however, in 1477, executed for treason, when the title dropped for a while. One of his sons, indeed, had the title conferred upon him by Charles VIII., a portion of the estates being restored at the same time, but he died without heirs in 1503. In 1506 or 1507 Louis XII. bestowed the duchy upon his nephew Gaston de Foix, who was killed at the battle of Ravenna in 1512. From 1528 to 1689 the duchy was possessed by the house of Savoy. In 1689 it was purchased by Louis XIV., who bestowed it upon the Orleans family. King Louis Philippe gave to his second son the title of Duke of Nemours.

NENAGH, a town in Ireland, in the county of Tipperary, picturesquely situated, 23 miles north-east of Limerick, on a commanding height, in view of the Devil's-bit Mountains. Its only objects of interest are an old castle and the ruins of a Franciscan monastery. Its manufactures are woollens, tobacco, soap, and candles; and its trade is in bacon, eggs, and butter. Pop. 5422.

NENNIUS, a British historian of the ninth century. His chronicle, Historia Britonum, or Eulogium Britanniæ, reaches down to the eighth century. The manuscript, written in Latin, is in the British Museum, and the work has been published several times. The best edition is that of J. Stevenson (London, 1838). An English translation by W. Gunn was published in 1819. Ellis speaks of the work as that of 'a credulous compiler, though, from the antiquity of his materials, valuable to an inquisitive historian.'

NEOPHYTE (from *neos*, new, and *phyton*, plant), in the Eleusinian and other mysteries, a person newly initiated; among the early Christians a new convert from paganism; in the monasteries a novice.

NEO-PLATONISM. See NEW PLATONISTS.

NEOZOIC PERIOD ('new life' period), a term sometimes applied in geology to include those rock formations ordinarily classed under the *Mesozoic* (or 'middle life') period and the *Kainozoic* (or 'recent life') period collectively, thus making only two life-periods, the *Palæozoic* and the *Neozoic*. The classification of the rock systems under the three periods is that generally preferred by geologists to their arrangement under the Palæozoic and Neozoic periods only. (See GEOLOGY.)

NEPA, a genus of Hemipterous insects, popularly known by the name of 'Water-scorpions.' The *Nepa cinerea* is a familiar tenant of all our pools, and exemplifies a typical member of the Water-bugs or Hydrocores. The family or tribe *Nepina* has been constructed for the reception of these forms, in which the head is small, narrow, and of triangular shape. The front pair of legs is modified to form organs for prehension; and by means of the sharp 'rostrum' or beak formed by a modification of the organs of the mouth these insects are capable of inflicting severe wounds. The metamorphosis is of the Hemimetabolic or incomplete variety. (See METAMORPHOSIS.) These insects swim well by aid of the two hinder pairs of legs, and breathing is subserved by the filamentous appendages of the abdomen, on which the 'stigmata' or respiratory apertures open, and through which air is conveyed to the system of air-tubes within the body. (See Pl. LXIX.–LXX. fig. 34.)

NEPAL, NIPAL, or NEPAUL, a kingdom in Asia, in the north of India, on the south-west slope of the highest part of the Himálaya range, between lat. 26° 25′ and 30° 20′ N., and lon. 80° 15′ and 88° 15′ E.; area, about 54,000 square miles. The country is a tableland from 3000 to 6000 feet above the level of the sea. It contains within its boundaries the highest mountains in the world—Mount Everest, Dhawalagiri, and on its eastern borders Kanchinjinga. From the mountains southwards the land gradually descends, forming four distinct terraces, differing in climate and vegetation. The climate is on the whole temperate except in the most elevated districts in the north, where it is very cold. The most important rivers are the Ghogra or Kanar, the Gandak, and the Kusi, all of which rise in Tibet on the north beyond the Himálayas, through which they force their way by narrow chasms of the most appalling depth. Numerous small streams traverse the low lands on the south, called Terai, or Teriyanee. Magnificent forests of sal, sisoo, and toon trees stretch along the declivities of the lower hills into the adjacent plains. The forests higher up exhibit a greater variety, gradually assuming more and more of an Alpine character. The principal products are rice, wheat, barley, pulse, sugar-cane, buck-wheat, hemp, cotton, tobacco, and madder. In the mountainous parts a valuable article of cultivation is a large species of cardamom, and in other places ginger is grown to a considerable extent. Pasturage is on the whole scarce and indifferent. The sheep and goats, however, have fine wool. Horses are imported from Tibet. The wild animals are elephants, black bears of great size, hogs, hog-deer, foxes, jackals, and a few tigers. Fish abound in the streams of the Teriyanee. The manufactures of Nepal are confined chiefly to two kinds of coarse cotton cloth, called khadi and changa, of which the dress of the middle and lower classes of the people is made. The whole dress of the higher ranks is imported, and consists chiefly of Chinese silks and of the low country muslins and calicoes. The military alone wear European broadcloth. Articles in copper, brass, and iron are also manufactured in various places; likewise bells of a kind of bell-metal called phul, but considered inferior to those of Tibet; and also a very strong paper, remarkably well fitted for packages. The trade of Nepal is chiefly carried on with British India and Tibet. From the former it imports Bengal cottons and muslins, silks and raw silk, carpets, English cutlery, &c.; and from the latter Chinese silk stuffs, paper, drugs, gold and silver, sheep, musk, skins of the musk-deer, &c. Its chief exports to both parts are the natural products of the country. The inhabitants are chiefly Newars, a race probably of Mongolian and Chinese origin. In the east there is a considerable mixture of Hindus. The prevailing religion is Brahmanism, but there are also some Buddhists. Most of the domestic servants are slaves. The country was formerly possessed by numerous independent rajahs, and then extended west to the Satlej; but about the middle of the last century the Rajah of Gorkha began to extend his dominions by conquest, in which he and his successors were so successful that in less than fifty years they had conquered the whole of Nepal, and made themselves kings of that territory. Subsequently (1816) a large portion of the kingdom was cut off by the British, who reduced its western limit to the river Kali instead of the Satlej. The ordinary language of Nepal is the Prabratiya or mountain Hindu dialect, but the Newars have a language peculiar to themselves. The government of the country is despotic. The ruler acknowledges a certain amount of dependence on the Chinese government, and every five years sends an embassy to China in token of his fealty. He is also obliged to suffer the presence of a British resident and a small body of British troops at his capital, Khatmandu. Pop. 2,000,000.

NEPENTHE (Greek, *nē*, a negative prefix, and *penthos*, sorrow), a drug which was fabled by the poets to banish the remembrance of grief and to cheer the soul. The invention was attributed to the Egyptians. According to Homer (Od. iv. 220) Helen learned the art of preparing it from the Queen of Egypt. It is thought by many to be opium.

NEPENTHES, or PITCHER PLANT, a singular and celebrated genus of plants (belonging to the natural order Nepenthaceæ), containing eight or ten species, which inhabit Madagascar, the East Indies, and the neighbouring parts of the continent of Asia. The flowers are diœcious; the stem is cylindrical and simple; the leaves are alternate, entire, and sheathing at base; they are strongly nerved, and the median nerve, which is larger than the rest, is prolonged beyond the leaf in the manner of a tendril, and terminates in a cylindrical urn. This urn is 3 or 4 inches in length by nearly 1 in diameter, and its orifice is covered with an orbicular lid, which opens and closes at certain periods. It usually contains a limpid and saline fluid. The analysis of the fluid found in a specimen in the Botanic Garden of Edinburgh yielded malic and a little citric acid, chloride of potassium, soda, lime, and magnesia. Dead insects are commonly found in the fluid, a cir-

cumstance which has led to the supposition that the plant is of a carnivorous habit.

NEPHRITE. This stone, which occurs chiefly in China, New Zealand, and North-west America, was formerly supposed to be a cure for diseases of the kidney—hence the name, from *nephros*, a kidney; it is essentially a silicate of aluminium and magnesium, containing varying amounts of manganese, iron, and calcium oxides. In colour nephrite varies from white to light green or bluish; it is tough, hard, compact, and tenacious. Specific gravity = 2·9 to 3·1. Nephrite belongs to the hornblende family, but varies considerably in composition.

NEPHROPS. See LOBSTER.

NEPHTHYS, an Egyptian deity, sister of Osiris and Isis, wife of Typhon, and mother of Anubis by Osiris. She was also called by the Greek writers *Teleutē* (End), *Aphroditē* and *Nikē* (Victory). Some consider her as the symbol of the Egyptian coast on the Mediterranean; others as the personification of the five intercalary days of the Egyptian year, in which point of view they are called her children by Mercury, the Sun, and Saturn.

NEPOMUK, JOHANN VON, or, as the Bohemian chroniclers also call him, JOHANNEK, is one of the most celebrated saints of the Roman Catholic Church, and the patron saint of Bohemia. The facts of his life which are satisfactorily authenticated are the following:—He was the son of a man named Welfin, a citizen of the small town of Pomuk, in Bohemia. Having entered the church, he was in 1372 appointed imperial public notary, in 1380 pastor of the church of St. Gall at Prague and notary and secretary to the archbishop, in 1381 doctor of canon law and canon, and soon after vicar-general and member of the metropolitan chapter of Prague at St. Veit. In the dispute which arose in 1393 between King Wenceslaus (Wenzel) and the Archbishop of Prague and his chapter concerning the choice of an abbot Nepomuk seems to have taken a prominent part, in consequence of which the king caused him to be seized, and, after being cruelly tortured, thrown from the bridge over the Moldau into the river (March 20, 1393). Such are the established facts of the life of Johann von Nepomuk, but in the course of the fifteenth, sixteenth, and seventeenth centuries these facts became totally altered in the popular legends regarding him, and he came to be held in so much veneration by the Bohemians that in 1729 Benedict XIII. canonized him. The day consecrated to his memory is the 16th of May. His protection is especially invoked against slander, since the legends ascribe his being put to death in the manner described to the fact of his refusing to betray to King Wenceslaus the secrets of his wife's confession. The marble sepulchre of Nepomuk is shown in the cathedral at Prague. The origin of the legend of Johann von Nepomuk and its historical foundation were thoroughly investigated by Abel, who published the result of his researches in a small treatise entitled Die Legende des heiligen Johann von Nepomuk (Berlin, 1855).

NEPOS. See CORNELIUS NEPOS.

NEPTUNE, the chief marine divinity of the ancient Romans, by whom he was borrowed, perhaps, from the Etruscans, who called him *Nethun*. Like the ancient Latin divinity Consus he was also the god of horses and patron of all equestrian exercises, in which relation he bore the title *Neptunus Equester*. His festival appears to have been celebrated on the 23d of July. When the Greek mythology was introduced into Rome he was completely identified with the Greek Poseidōn, all the traditions relating to whom were transferred by the Romans to their own deity. See POSEIDŌN.

NEPTUNE, in astronomy, the most distant of the known planets, his mean distance from the sun being 2,745,998,000 miles, and his least distance from the earth 2,629,000,000 miles. The eccentricity of his orbit is ·00872; its inclination to the plane of the ecliptic is 1° 47′. His apparent diameter is about 2·7″. His real diameter is estimated at 36,600 miles, and he seems to have very little polar compression. His mass is about 16¾ times that of the earth. The largest telescopes give us little information as to whether or not he has belts; the direction of his axial rotation, as indicated by the motion of an apparent satellite, seems to be opposite to that of the other planets, but this supposition must be received with caution until examination by such a telescope as Lord Rosse's confirms it. He revolves round the sun in 164·6 years.

The discovery of Neptune must always be regarded as a splendid triumph of the Newtonian system. M. Bouvard had great trouble in representing the perturbations of the motion of Uranus as due to the influence of Jupiter and Saturn, and he fancied the existence of an exterior planet. In 1834 the Rev. T. Hussey asserted the existence of an exterior planet. Bessel entertained the notion of inquiring mathematically into the matter. Mr. J. C. Adams, when a student at Cambridge, entered in his diary in July, 1841, a memorandum of his intention to attempt the solution of the question, but he did not begin the work until January, 1843. In October, 1845, he sent the results of his one and a half year's labour to the astronomer royal. He accounted for the perturbations of Uranus in the disturbing action of an exterior planet, whose elements he had calculated. In 1845 M. Le Verrier took up the matter; he published his first memoir to show that Jupiter and Saturn were not the only masses whose attractions affected Uranus. In June, 1846, in his second memoir, he assigned elements for an exterior planet as Adams had done eight months before. A copy of this memoir reached Mr. Airy on June 23, and as the results of Adams and Le Verrier were in close agreement, the large Northumberland Telescope at Cambridge was somewhat tardily brought into use to search for the new planet. On September 29th the attention of Professor Challis was attracted by the appearance of an object which was subsequently proved to be the planet sought. Le Verrier in August published a third memoir containing revised elements, in which particular attention was paid to the position in the heavens of the planet. On September 23d a letter was received at Berlin containing a summary of his results, and on the same evening the planet was discovered. It is unfortunate that the results of Adams were not published in 1845. All impartial minds are satisfied with an equal participation of the honour of the discovery by Adams and Le Verrier. The wonderful agreement of the calculated and observed heliocentric positions of the planet may here be noted:—

Observer at Berlin	326° 52′
Computed by Adams	329 19
Computed by Le Verrier	326 0

NÉRAC, a town, France, in the department of Lot-et-Garonne, 16 miles W.S.W. of Agen, on the precipitous banks of the Baise. The most interesting building is the old castle, though now a mere ruin. In it Henry IV., of whom there is a bronze statue in the town, spent part of his youth, and at an earlier period Calvin and other reformers found an asylum with Margaret of Valois, queen of Navarre. Several interesting Roman antiquities have been brought to light by excavation. It has manufactures of coarse woollens, ship-biscuit, corks, &c. Pop. (1881), 7429.

NERBUDDA, or NARBADA (Sanscrit, *Narmadá*), a river, Hindustan, which rises on the north-west confines of the ancient territorial division of Gondwana, in the Central Provinces, flows first west and north-west across a plateau, then west, inclining gently to the south, forming part of the boundary between the Central Provinces and Indor, and falls into the Gulf of Cambay, after a course of about 600 miles. In the wet season it rises in some places 25 feet, and in others 70 feet above its lowest level. Though much obstructed by shelves and cataracts, it is navigated by boats to the falls of Daree, about 250 miles from its mouth.

NEREIDS, sea nymphs, daughters of Nereus and Doris. They were fifty in number, and they had, like their father, the gift of prophecy and the power of assuming different shapes. They were specially the nymphs of the Mediterranean, and were distinguished on the one hand from the Naiads or the nymphs of fresh water, and on the other hand from the Oceanides or nymphs of the ocean.

NEREIS, a genus of marine worms, belonging to the order Errantia, of the class Annelida. These forms present bodies of distinctly annulated appearance. A distinct head is present, provided with a retractile proboscis, which is usually armed with teeth or jaws. Eyes and tentacles are borne on the head. The locomotive appendages are very fully developed, and the respiratory or breathing organs, in the form of tuft-like *branchiæ* or gills of rudimentary nature, are borne on the dorsal aspect of the body-segments—hence these and allied worms are sometimes designated 'Dorsibranchiate' annelidans. The digestive tract is provided with lateral sac or pouch-like dilatations, reminding one of the conformation of the alimentary canal in the leech. The sexes are contained in separate individuals, and the young at first appear as free-swimming ciliated bodies. As development proceeds the head segments of the future worm are formed at one portion of the embryo, whilst the tail and body segments are developed from another part. New parts and segments are gradually interposed or intercalated between the head and the already developed joints, and in due time the perfect body is thus formed. The popular name of 'Sea-centipedes' has been applied to these worms from a fancied resemblance to the familiar land centipedes; the likeness being in some cases rendered more forcible by the jointed or segmented appearance of the locomotive appendages. The family Nereidæ includes many genera, most of which are represented on the British coasts.

NEREUS, an inferior divinity of the sea, sometimes also the sea itself, when it is calm. He was the oldest son of Pontus (the Sea) and Gaia (the Earth). The poets represented him as a faithful, benevolent old man, the friend of justice and moderation, and the enemy of oppression. He possessed the gift of divination in a greater degree than all the gods of the three elements—air, earth, and water—and like other gods of the sea could convert himself into all shapes. By Doris, the daughter of Oceanus, his spouse, and other goddesses, he was the father of the Nereids. His chief place of residence was the Ægean Sea. When Paris sailed through this sea with Helen, whom he was carrying off, Nereus, according to the beautiful ode of Horace, warned him of the destruction of Troy. In the ancient works of art, and also by the ancient poets, he is represented as an old man, with a wreath of sedge, sitting upon the waves, with a sceptre in his hand.

NERI. See GUELFS.

NERI, ST. FILIPPO DE', the founder of the congregation of the Oratory in Italy, was born in Florence in 1515, of a noble family. From early youth he distinguished himself by piety and application to study. A rich uncle, a merchant, intended to make him his sole heir, but Neri left him secretly, and went to Rome in 1533, where he became tutor in the house of a gentleman of Florence. At the age of twenty-three he sold his books, and gave the price to the poor. He now devoted himself entirely to the sick and pilgrims. In 1548 he established the fraternity of the Holy Trinity, for the purpose of aiding strangers who came to Rome for devotional purposes, and soon after he founded the hospice for the reception of pilgrims, which has become one of the finest in Rome. He did not take orders until the year 1551, having considered himself until then unworthy of them. Soon after he entered the community of St. Jerome, and instructed children, and finally also young ecclesiastics, who were called *oratorians*, because they placed themselves before the church to call the people to prayer. In 1564 Neri collected these disciples into a community, and gave them regular statutes, but imposed no vow, wishing that they should always remain united by the bonds of charity only. Gregory XIII. sanctioned this congregation in 1575, and gave them the church Sta. Maria di Vallicella. The congregation soon spread over Italy. Baronius, one of his most distinguished disciples, assisted him in his last sickness. He died May 26, 1595. His letters were published at Padua in 1751. He wrote several other works; also poems, to be found in vol. i. of Rime Oneste. His life was written by Ant. Gallonio, his disciple, and the eye-witness, as he says, of most of the extraordinary deeds he describes. His life is also to be found in vol. v. of the Acta Sanctorum.

NERIAD, a town in India, in the Presidency of Bombay, in the district of Kaira, 35 miles north-west of Baroda, occupying the heart of a region in which tobacco is very extensively grown. Pop. about 26,000.

NERO, LUCIUS DOMITIUS AHENOBARBUS (after his adoption by the Emperor Claudius called *Claudius Cæsar Drusus Germanicus*), the son of Cneius Domitius Ahenobarbus and Agrippina, the daughter of Germanicus, was born at Antium A.D. 37. His adoption was due to the marriage of his mother with the emperor. Soon after, when only sixteen years of age, he married Octavia, the daughter of Claudius and Messalina (53 A.D.) The marriage was brought about by Agrippina, who wished to secure the succession to her own son to the prejudice of Britannicus, the son of Claudius. In this she succeeded, and Nero became emperor on the death of Claudius in the year following (54 A.D.) If Claudius had lived a few years longer Nero might have had an excellent education, for his tutors were two able and honourable men, Burrhus, the præfect of the prætorian guards, and the philosopher Seneca; but he was enabled, by becoming emperor, to throw off all restraint at too early an age. For a short time he gave a promise of reigning well, and allowed himself to be guided by his instructors, but it was not long before he gave himself to the greatest excesses and cruelty. His first crime was the poisoning of Britannicus (55 A.D.), whom Agrippina, having quarrelled with her son, threatened to raise to the throne in place of Nero. He next caused Agrippina herself to be put to death (A.D. 59). The ridiculous desire of being esteemed a great performer in music ruled in his bosom superior to all other passions. He performed in public, and placed soldiers as spies to observe those who did not appear inclined to admire his voice or his execution. He wished also to be distinguished in the chariot race. He traversed all Greece with a retinue of artists, and of course won the first prizes in all the celebrated contests and

games. Sensuality made him ingenious in gluttony and in the gratification of his natural propensities; extravagance made him covetous, and danger made him cruel. The most distinguished victims to his cruelty, besides Britannicus and Agrippina, were his instructors Burrhus and Seneca, the poet Lucan, and his wives, Octavia, whom he divorced on pretext of barrenness, and then banished to the island of Pandataria on a false accusation of adultery, where he soon after caused her to kill herself by opening her veins, and Poppæa Sabina, for whose sake he had neglected and repudiated Octavia. 'My predecessors,' said he, 'did not know the rights of monarchy. People may hate me, if they only fear me.' During his reign, in 64 A.D., a great conflagration took place at Rome, which lasted nine days, and in which most beautiful monuments of art and of history were burned to the ground. Nero was commonly suspected of being the originator of this fire, with the view of having a real representation of the burning of Troy; and although this suspicion is regarded by modern scholars as almost incredible, it was so generally entertained at the time that Nero did his utmost to transfer the guilt of this action to the Christians, whom he caused to be cruelly persecuted for it throughout the empire. Both St. Paul and St. Peter are said to have been among the victims of these persecutions. As his passion for building was very strong, he caused that part of the city which was burned to be rebuilt in a manner more splendid and magnificent than before. The most remarkable of his buildings was the palace which he erected for himself in Rome, and which was known under the name of the Golden House. His extravagance in other things—clothes, hunting, furniture, &c.—was as boundless as his munificence to the people of Rome, whom he enriched by great largesses (*largitiones*, common in the republic only under certain circumstances), while the provinces were oppressed by the weight of taxes. Several conspiracies were formed against him in Rome, which ended in the destruction of the conspirators themselves. At last the revolt of Galba, his governor in Spain, whose cause the senate also espoused, succeeded. The tyrant anticipated the punishment which awaited him by committing suicide, A.D. 68.

NERVA, the successor of Domitian, and one of the most virtuous of the Roman emperors. He was born in Umbria in 32 A.D. In A.D. 71 he was consul along with Vespasian. He became emperor at an advanced age, after the assassination of Domitian, A.D. 96. He was a man of cultivated mind, with some poetical talent, but he was too weak for the dignity to which he was raised. He performed many beneficent acts, provided for the public tranquillity and the execution of justice, and relieved the poor; but he was unable to put down the violence and insubordination of the prætorian soldiers. Seeing his own defects as a ruler, he had the wisdom to adopt as his son and successor a man of totally opposite temper, M. Ulpius Trajanus, then commanding an army in Germany. He died A.D. 98.

NERVE, Nervous System. By the nervous system of any animal form we mean to denote the apparatus through the agency of which the organism is brought into relation with the external world or medium in which it exists. In this way the being receives certain sensations, and in the higher animals is enabled to distinguish between these sensations, or primarily, to appreciate them; and as a second and as essential a part of nervous action may be added the reaction upon the outer world of the animal in virtue of the sensations received or appreciated. The nervous system, in short, forms the medium through which every act or detail of animal life is inaugurated and directed; and this duty involves the bringing of the organism firstly into relation with the external media, and secondly into relation with itself as affected by these media. The nervous function has accordingly been variously termed, as that of *relation*, *correlation*, *innervation* or *irritability*, all of which names have an obvious bearing upon the broad view of nervous action given above.

The essential, and at the same time the simplest, idea of any nervous system is involved in the necessary presence, firstly, of a *nerve-centre* or *centres*, which generate the nervous force or impulse; secondly, of conducting fibres or cords, the *nerves;* and thirdly, of an *organ*, *part*, or *structure* to which the impulse or impression may be conveyed. The third or latter condition, although generally present, and necessary, in a sense, to render this primary idea of the nervous system clear, may yet in many cases and examples of nervous action be omitted from consideration. The nerve-centres of man and Vertebrata are disposed to form two chief sets, which are to be regarded as essentially distinct, but also as possessing certain relations to be hereafter noted. The brain and spinal marrow together constitute the first of these centres, and are collectively included under the name *cerebro-spinal system* or *axis*. The second system is the *sympathetic* or *ganglionic*. From each of these systems nerve-cords are given off—the *cerebral* and *spinal* nerves from the former; and the so-called *sympathetic* fibres from the latter. The brain and spinal cord are contained within the continuous bony case and canal formed by the skull and spinal column; whilst the chief masses of the sympathetic system form an irregularly disposed chain, lying in front of the spine, and contained within the cavities of the thorax or chest and abdomen. Briefly stated, the general functions of the cerebro-spinal system are those concerned with volition and muscular movements, with the control of the senses, and in higher forms with the operations of the mind. The nerves of the sympathetic system in chief are distributed to the viscera, such as the heart, stomach, intestines, blood-vessels, &c.; and the operation of this system is in greater part of involuntary kind, and without the influence or command of the will.

The structure, general and microscopic, of the nervous system, reveals much that is characteristic, and

Nervous Tissue seen under the Microscope.—*a b*, Spherical nerve-cells. *e*, Bi-polar cell. *f g*, Multi-polar cells. *h*, Cells of the ganglia and nerve-fibres. *i*, Nerve-tube and axis-cylinder. *k*, Termination of a nerve-fibre in an organ.

gives us, in many cases, valuable information concerning the working of its intimate parts. In ner-

vous tissue two elements may be discerned by microscopic examination. These elements are *nervous fibres*, and *nerve* or *ganglionic* corpuscles. The nerve fibres may be studied in the ordinary nerves which take origin from the cerebro-spinal centres; with the exception of the olfactory nerves—or those ministering to the sense of smell—and the fibres of the sympathetic system, which exhibit a marked difference of structure from ordinary nerve fibres. The latter consist of delicate tubules, bounded by an outer or *limiting membrane* of structureless consistence and nature, each containing the essential nerve-substance. This substance is clear, somewhat oily in appearance, and exhibits no differentiation of parts. It is readily compressible, and escapes from the extremity of the tubule on pressure. After death, or in nerves which are not in a perfectly fresh state, or under the action and influence of chemical reagents, a process of coagulation takes place within the tubule; and this process produces in the central portion or axis of the tubule a thickening or thread-like structure known as the *axis cylinder*, whilst the cortical or outer portion of the tubule's contents becomes opaque and granular, and forms the so-called *white substance of Schwann*, or *medullary sheath*, as it has been also termed.

The various tubules which compose a single nervous trunk are bound and connected together by *connective tissue*, whilst the nerve-trunk itself is invested by a sheath of areolar tissue analogous to the sarcolemma of muscle, and known as the *nerve-sheath* or

A Nerve and its ramifications seen by the naked eye.

neurilemma. The different fibres of a nerve-trunk lie side by side within the sheath, and do not, save in a few instances, separate out, unite, or divide. The division into branches takes place at the peripheral or surface-terminations of the nerves, where they are distributed to organs or tissues; and the exact mode in which the nerve-fibres terminate, after they grow smaller and of finer proportions, has not as yet been definitely ascertained.

The nerve-fibres may exhibit a diameter so great as the $\frac{1}{1800}$th of an inch; but their average breadth may be stated to vary from $\frac{1}{7000}$th to the $\frac{1}{3000}$th of an inch. The largest fibres are those of the nerve-trunks themselves; and they diminish in size in the neighbourhood of the nerve-centres—brain and spinal marrow—and as they approach to the periphery of the body or to their ultimate terminations. The nerve-fibres of the brain and spinal marrow do not exhibit a limiting membrane; and in the gray matter of the brain and cord the fibres are of exceedingly small size, not exceeding the $\frac{1}{10000}$th or $\frac{1}{14000}$th of an inch in diameter.

The *chemical composition* of nerve-substance and fibres shows that the axis-cylinders of the fibres are albuminous in nature. The white substance or medullary sheath consists chiefly of *protagon*, into the composition of which phosphorus enters. This protagon is not dissolved by ether, but is soluble in warm alcohol. When decomposed it gives compounds of fatty nature. The axis-cylinder readily absorbs carmine, but is unaffected by chromic acid. The medullary sheath, on the contrary, does not imbibe carmine, but becomes opaque and of brownish hue when treated with chromic acid. This latter structure also becomes laminated, or exhibits a divided appearance into thin layers under the influence of the acid.

The fibres of the olfactory and sympathetic nerves exhibit differences in structure from that just described as peculiar to the fibres of the cerebro-spinal system generally. The sympathetic fibres are thus of finer and more delicate nature than the ordinary fibres. They exhibit a darker colour, and are hence termed *gray fibres*. They probably also want the medullary sheath of the cerebro-spinal fibres; and the contents of the tubules appear to consist of a uniform matter, which most nearly corresponds to the *axis-cylinder* of the ordinary nerves. Large nuclei are also found in connection with these gray fibres. Certain nerves are found to present a combination of the characters of the ordinary and gray fibres; and in this view it may reasonably be doubted whether any grave or material difference exists between the functions or properties of the two kinds of nerve-fibres.

The subject of the *origin* of nerve-fibres from nervous centres will be noticed as the nature of these centres is discussed; but it may be appropriate at the present stage to note what is definitely known respecting the *terminations* of nerves in the periphery of the body—that is, in the parts and organs to which they are distributed. Thus nerves may terminate apparently in net-works or *plexuses* of delicate nature, as seen in the nerve-supply of muscles, mucous membranes, &c. Or the nerve-fibres may end in special structures, chief among which may be noted the *Pacinian bodies*, the *touch-corpuscles* of Wagner, and the *end-bulbs* of Krause. The former are principally found in the subcutaneous tissue of the fingers and toes, and average $\frac{1}{16}$th of an inch in length. Each Pacinian body is composed of the expanded extremity of a nerve-fibre, surrounded by or enucleated amongst tissues. These bodies also occur on the mesentery and on the sympathetic plexuses of certain of the abdominal nerves. The *touch-corpuscles* are found in the *cutis vera* or true skin, in the papillæ or prominent sensitive projections of its surface. Each consists of a central nucleated structure, around which the terminal nerve-fibres are coiled. The *end-bulbs* are situated below the papillæ on such places as the lips, the conjunctiva of the eye. The nerve-fibre apparently terminates in the interior of the bulbs. In other cases nerve-filaments may be traced between the cells of the epidermis or outer skin, and may possibly terminate within these cells, although this latter idea has not been traced out to actual demonstration. In the eye, ear, &c., the ultimate nerve-fibres have been apparently traced to a termination in the cells of the structures they supply. The ends of nerves may be free, and unconnected structurally with the parts to which they are distributed, such modes of termination being found in muscular plexuses. And the so-called *motor* or *motorial nerve* or

end-plates (Rouget), exhibiting diameters varying from $\frac{1}{8000}$th to $\frac{1}{250}$th of an inch, constitute another mode of nerve-termination, seen in muscles, and consisting apparently of the dilated extremity of the nerve-fibre, imbedded in and inclosed by connective tissue.

The *nerve-corpuscles* or *nerve-cells* form important structures in the consideration of the relative parts of the nervous system. These corpuscles are related chiefly to the *central* or *vesicular* portions of the system. The nerve-cells do not possess a wall, but may be inclosed with a nucleated sheath. Each consists of a granular protoplasmic mass, with a central particle or *nucleus* of clear consistence, whilst one or more smaller particles or *nucleoli* may be contained within the nucleus. The nerve-cells are dark in colour, and impart to certain portions of the nerve-centres (for example, the brain and spinal cord) the gray appearance therein observed. They vary in form, some being *simple* and of oval or rounded shape; others giving off branches or processes of various kinds, when they are termed *polar*, *stellate*, *bipolar*, or *multipolar*. The simple corpuscles are found chiefly in the sympathetic *ganglia* or centres. The multipolar or ganglion corpuscles are found in the spinal cord and elsewhere; and these poles or branches appear to be continued in some cases into nerve-fibres, or to join those of neighbouring corpuscles; or the processes may of themselves branch out and divide in a manner similar to the ordinary nerve-fibres.

The *general functions* of nerve fibres, the structure of which has just been described, may be briefly considered under two aspects. The fibres may thus convey impressions *from* the brain or nerve-centres *to* their peripheral extremities, or to the parts to which they are distributed. Or secondly, they may transmit sensations or impressions *from* the periphery, or from the parts they supply, *to* their centres. A double series of nerve-fibres, each set subserving one or other of the preceding functions, exists in the cerebro-spinal, as well as in the sympathetic nervous system. These series are therefore known as *sensory*, *afferent*, or *centripetal* nerves, when they transmit impressions from their peripheral extremities to the brain or centres; and as *motor*, *efferent*, or *centrifugal* nerves, when they carry impressions from the centres to their peripheral terminations.

Stimuli of various kinds applied to the nerves arouses the so-called *excitability* of the fibres, and through this property nerves convey impressions thus made upon them. But the nerves themselves do not appear capable of generating or evolving nervous force, and the nature of this force is as yet imperfectly understood. The sensory nerves may thus be acted upon or stimulated from without; whilst the motor nerves are similarly influenced from within by the will. But in both kinds of nerves the different stimuli produce the same effect of bringing the excitability into play—an effect differing not in kind but only in degree, and in the ulterior results of the stimulation.

The rate at which impressions are conveyed by nerves, or the rate of nervous force, has been calculated and measured with nicety by aid of delicate physiological appliances. Helmholtz says that in human motor nerves the impulse travels at the rate of 111 feet per second; but the rate appears to vary not only in different nerves, but in the same nerve under different conditions and at different times. In sensory nerves the rate is stated to average 140 feet per second.

Nerve fibres in any case—motor or sensory—can carry one kind of impulse only, corresponding to the kind of fibre. In certain nerves the impulses or impressions are of a limited or specialized kind, as in the nerves of special sense—for example, sight, hearing, smell—whereby certain distinct sensations, of light, sound, or odours are produced. And such nerves, therefore, respond only to stimuli of the special kind above mentioned.

The fibres of sensory and motor nerves are indistinguishable in the nerve-trunks themselves. And it is at the origin of the trunks, and at their point of juncture or union with the nervous centres, that the different and distinct fibres of the motor or sensory nerves may be clearly perceived—as in the anterior and posterior roots of the spinal nerves, where they issue forth from the spinal cord.

The various nerve-centres of the body which originate, or at any rate direct and dispose the nerve-force, may be viewed as simple *ganglia*, or as collections of ganglia, or nervous masses. The brain itself falls under this latter division, and, like all other nerve-centres, is distinguished by its possessing nerve-corpuscles or 'vesicular nerve-substance.' The general functional relations existing between the nerve-centres and the nerves may be simply illustrated by the phenomena comprehended under the name of *reflex action*. When a peripheral nerve-fibre is irritated a sensory or centripetal impression is conveyed, as already explained, towards the nerve centre. Arriving at the centre the impression is converted into a motor or centrifugal one, and travels along the motor nerve-fibres, to excite, it may be, a muscle or other part to action. In the case of the muscle the impression would be named an *excito-motor* one; whilst if some gland or secreting structure were excited, the impression is termed *excito-secretory*. In either case the sensory nervous impression first received is *reflected*, as it were, to the other or motor nerve-fibre, and through this latter calls some part of the bodily mechanism into play. Nervous impressions may or may not be reflected to their original source; and where the brain acts as the nerve-centre, sensation is produced. And the general functional relation of the nervous system may be summarized by stating that its functions comprehend the reception and distribution of impressions; that these impressions originate either from influences acting on the periphery, or from the nerve-centres, brain, or mind; that these impressions respectively influence or stimulate the mind or nerve-centres, and the muscles or secreting structures; and lastly, that all nervous phenomena are exerted through, or accompanied by nervous action, and that this latter is, so far as physiology has yet been able to determine, of a uniform and similar kind.

The structure of the brain has already been noticed in the article BRAIN, and the conformation and functions of the spinal cord will be noticed under that heading. The sympathetic system will be reviewed under the article on that subject; whilst details of the special senses will be found in the articles EYE, EAR, NOSE, LIGHT, &c.

The homology of the nervous system of Invertebrate forms with that of Vertebrata has formed subject-matter for much discussion. The Invertebrata possess no such specialization of the nervous centres as is seen in Vertebrates, in which the brain and spinal cord are enclosed within their bony case and canal, and thus shut off from the general cavity of the body. According to some authorities, the nervous ganglion or mass placed in Invertebrata above the mouth or oral extremity, is the representative, in itself, of the cerebro-spinal axis of Vertebrates. Whilst by others the sympathetic system of Vertebrates is viewed, as in the main, corresponding to the single nervous system of Invertebrate forms. The great and distinctive feature between the nervous system of Vertebrata and that of lower forms con-

sists in the absence of a defined or chief nervous centre, through which consciousness may intervene to render the being intelligent, and aware of the nature of the acts it performs. Thus in Invertebrata generally, the actions performed are of a simple or reflex kind. The lower animal responds to impressions made on its sensorial nerves, and hence such impressions are termed *sensori-motor;* and are very different from the operations of the higher or Vertebrate being, in which consciousness largely enters into the phenomena of nervous action. The actions of the lower animal are purely adaptive, as regards the surrounding circumstances. The same surroundings, as in the case of the ant, wasp, or bee, produce the same effects, marvellous enough in their way, but purely of sensori or excito-motor kind, and destitute of the 'intelligence' of the higher Vertebrate.

NERVOUS DISEASES are such as consist in disturbed affections of sense and motion, unattended by any chronic or acute inflammation or hemorrhage, or by any disturbance of the circulation. Nervous diseases may be divided into nervous pains, called *neuralgias; spasms* are involuntary contractions in organs which have muscular fibres, or which are merely susceptible of contraction; *convulsions* are involuntary and irregular contractions, alternating with relaxations, in one, or several, or all of the muscles, simultaneously or successively; *tetanus* is a permanent contraction of a certain class of muscles, ordinarily followed by death; *contraction* is a retraction of the flexor muscles of one member, or of two parallel members; *paralysis* is the diminution or loss of the sensibility of an organ of sense, or the contractility of an organ of motion. The pains, spasms, paralysis, take different names according to the parts affected. The affections of the mind, known under the names of *mental alienation, insanity, idiocy,* &c., arise also from disturbances in the action of the nervous system. It has been asserted that nervous diseases are rendered more common by the progress of civilization; and, in fact, the nerves become more irritable, and therefore more liable to be diseased with the progress of intelligence. But the refinements of the moderns in their food and drinks, the use of fermented liquors, wine, coffee and tea, are the most frequent causes of nervous maladies. The early and excessive use of these liquids provokes the nerves, and diseases the stomach, and gives rise to cerebral fevers in children, to the vapours or hysterics (see HYSTERIA) in women, to hypochondria (see HYPOCHONDRIASIS), apoplexy, and paralysis in men. It is not always easy to distinguish the symptoms of nervous disease from those of inflammation; but, as the treatment in the two cases must be entirely different, it is of the greatest importance to use every caution in this respect. Particular medicines, which were considered as specific remedies in nervous diseases, were formerly in use; but experience has proved that warm bathing, soothing drinks, vegetable diet, exercise, recreation, sometimes bleeding, at others rubefacients, opium in a few cases when the pain is great, and quinine, are the best remedies. The treatment of nervous diseases, however, has often embarrassed the practitioner, as they may resist the most skilful and sagacious applications. See the articles NERVE, INSANITY, &c.

NERVURES, the horny ribs which support the wings of insects. Each wing consists of two delicate expansions of the integument or skin of the body; and between the two layers the nervures are placed, and serve to stretch and support the entire structure. The nervures are in reality hollow tubes, which contain prolongations of the tracheæ or 'air-tubes,' by means of which the breathing of insects is carried on. And blood-vessels also appear to be continued into the nervures, as well as filaments from the nervous system. In this way the wings become subservient to the process of breathing or respiration in insects; and this disposition of parts may also have the function of inflating the layers of the wings with air, and of thus assisting the flight.

NESS, LOCH, a lake in Scotland, Inverness-shire, traversed by the Caledonian Canal. It is long and narrow, stretching S.S.W. and N.N.E. about 22 miles, with a breadth varying from 1¼ to 2 miles. Except at the extremities, where it shallows, its depth is from 100 to 130 fathoms. It occupies the centre of the valley of Glenmore, inclosed on the north side by precipices of reddish-coloured granite, about 1000 feet high, but widening out on the south into a tract of considerable fertility and beauty. Owing to the want of wood, the scenery is not very striking. The outlet of the lake is by the Ness into the Moray Frith.

NEST, the abode or habitation, varying greatly in form, materials, and situation, constructed by birds chiefly for the purposes of incubation and the rearing of the young. Insects also, in many instances, construct abodes or habitations to which the term 'nest' may be correctly enough applied. And even amongst Fishes and the Mammalia examples of nest-building habits are not wanting. Some birds build their nests with what, in the case of rational beings, would be called great ingenuity; others with the greatest negligence. They seem to be governed in the process merely by instinct. Birds of cooler climates, that build early in the spring, require warmth and shelter for their young, and the blackbird and thrush line their nests with a plaster of clay, perfectly excluding the keen icy gales of the season; yet, should accident destroy this first abode, they will construct another, even when the summer is far advanced, upon the model of the first, and with the same precautions against severe weather, when all necessity for such provision has ceased, and the usual temperature of the season rather requires coolness and a free circulation of air. The house-sparrow will commonly build four or five times in the year, and, without the least consideration of site or season, collect a great mass of straw and hay, and gather many feathers to line the nest. The wood-pigeon and jay, which build on the tall underwood in the open air, will construct their nests so slightly, and with such a scanty provision of materials, that they seem scarcely adequate to support their broods; and the rook's nest is at times torn from its airy site, or its eggs are shaken from it, by the gales of spring. The house-martin builds its earthy shed under the roof of the house, &c., and usually brings out its young in July and August; but one rainy day at this period, attended with wind, will often moisten the earth that composes the nest; the cement fails, and all the unfledged young ones are dashed upon the ground. The variety of spots chosen by birds according to their species is endless; and under the various articles relating to birds, insects, &c., information will be found regarding the form and other details of nests.

NESTOR, one of the Greek heroes at Troy distinguished for his great age, experience, and wisdom, as well as for his mild and persuasive eloquence. These are the qualities Homer has attributed to him in the Iliad. He was the son of Neleus, king of Pylos, and Chloris, and was born and brought up at Gerania, in Messenia. He succeeded his father as King of Pylos. In his youth and manhood he distinguished himself by many bold exploits, and early acquired the reputation of a prudent counsellor and persuasive orator. He signalized himself among the Lapithæ, whom he assisted in their war with the Centaurs, and he was present at the hunting of the Calydonian boar. Notwithstanding he had lived through two

generations when the expedition to Troy was undertaken he nevertheless took part in it, and conducted the forces under his command in twenty, or, according to some accounts, in ninety vessels to Troy. On account of his extreme age he did not take a personal action in the encounters before the city. The part which is attributed to him in the Iliad is that of an experienced counsellor. He endeavoured to produce a reconciliation between Agamemnon and Achilles, and encouraged, advised, instructed, and blamed the Grecian heroes. Without his interference the siege of Troy would more than once have been abandoned. After the capture of Troy he returned to Greece. According to the Odyssey Telemachus here visited him to obtain information concerning Ulysses. Homer states Eurydicē, the oldest daughter of Clymenē, to have been his wife; others, Anaxibia, the daughter of Craticus. He had several sons and daughters, but they are not distinguished in history. After Nestor had outlived three generations he died quietly at Pylos, where, in the time of Pausanias, the inhabitants pretended to distinguish his dwelling and his grave.

NESTOR, a Russian historian, born about 1056, was a monk in the Petcherian or cavern monastery in Kiev, and died after 1116. Besides biographies of abbots and other pious members of his monastery, the fragments of which were collected by another hand, he wrote a chronicle in his vernacular tongue, which is an important contribution to the history of the North, he having evidently imitated and profited by the Byzantine historians with regard to the most ancient history. The other sources from which he obtained information are unknown. He wrote much as a contemporary, or from the traditions of an old monk of the monastery, Jan. The original text of his chronicle is lost, and by the interpolations of those who have continued the history (Bishop Sylvester of Kiev, and many others) to the year 1203, it is altered to an incredible degree, so that no correct decision can be passed upon his historical merits before strict inquiries have been made to determine how much of the historical information now extant is derived from the ancient Nestor. A part of Nestor's chronicle from the Pushkinian manuscript was printed in 1814 by Timkofsky at Moscow, and a complete edition in 1841 by Pogodin. A translation into German by Schlözer, which, however, only comes down to 980, was published at Göttingen in 1802–9; and a translation of the whole into French by Louis Paris, at Paris in 1835.

NESTORIUS, a famous heresiarch, probably born at Germanicia, a small town on the northern frontiers of Syria. He became Patriarch of Constantinople A.D. 428, and signalized his entry into this office by the expulsion of the Arians from the city. He then roused great opposition in the church by teaching the doctrine of Theodore of Mopsuestia, that there were two distinct persons in Christ, the divine and the human, and that the Virgin Mary, although she was the mother of Jesus Christ, was not entitled to be called the mother of God (*Theotokos*). The leader in the opposition raised against Nestorius was Cyril of Alexandria, who, at the council of Ephesus in 431, procured the condemnation of the doctrine taught by Nestorius and the deposition of the patriarch. Nestorius was afterwards banished to the Thebaïd, where he died. His followers, called Nestorians, were persecuted by several Greek emperors in succession. Their property was confiscated, and their books burned. In consequence of this they emigrated to Persia. At the present day Nestorianism is professed by a sect in the mountains of Kurdistan, and by another body in India. See CYRIL OF ALEXANDRIA.

NESTS, EDIBLE. See BIRD'S NEST.

NET (Italian, *netto*, pure), that which remains of a weight, quantity, &c., after making certain deductions. Thus, in mercantile language, the *net weight* is the weight of any article after deducting tare and tret; *net profits, income*, &c., is the absolute profit or income, after deducting expenses, interest, &c. It is opposed to *gross* (*brutto*).

NET, an open fabric made of hemp, jute, flax, and sometimes of cotton and other fibres. The open spaces are called *meshes*, and in order that these may retain their shape and size the fibres of which the net is made have to be knotted at the intersections. Nets were formerly made only by the hand, but an ingenious kind of machinery has at last been invented by which the operation of netting can be performed mechanically. Machinery of this nature was first introduced in the establishment of the Messrs. Stuart at Musselburgh in Scotland. Nets are used for a great variety of purposes, but chiefly for fishing. The three chief kinds of nets used in fishing are the seine, the drift-net, and the trawl. The first two are very long in proportion to their breadth, and differ from one another only in the manner in which they are employed. The seine has a line of corks along one of its long borders, and a line of leaden weights along the other; so that when the net is thrown into the water it assumes a perpendicular position. The drift-net is not loaded with lead, but floats in the water. The trawl, again, is dragged along the bottom by the motion of the boat. Nets are also used to catch birds and quadrupeds, to protect crops from birds, the blossoms of trees from frost, &c.

NETHERLANDS, THE KINGDOM OF THE (Dutch, *Het Koningrijk der Nederlanden*), a kingdom of Europe which embraces at the present day the north and smaller half of the numerous provinces formerly combined under the same denomination, and lies between lat. 50° 43′ and 53° 30′ N.; and lon. 3° 20′ and 7° 20′ E. On the west and north it is bounded by the North Sea, on the east by Prussia (Rhine Province, Westphalia, and Hanover), and on the south by Belgium. The boundaries landwards are scarcely anywhere formed by natural features.

General Description.—The Netherlands (or Low Countries, as the name implies) form the most characteristic portion of the great plain of northern and western Europe. From the middle of Belgium, a few miles north-east of Brussels, the country becomes a dead level, extending in monotonous sandy flats, through Hanover, Jutland, Holstein, and, with little interruption, through Prussia into Russia. But the lowest part of this immense level, and that which has most recently emerged from the sea, is undoubtedly the country lying between the mouths of the Scheldt and Ems. Within this distance the Rhine, joined by the Maas, Ijssel, and other rivers, enters the sea through a number of arms, and sluggish, winding channels, which by no means represent the magnitude of the main stream as it flows higher up. The delta of the Rhine may be conceived to have been in early ages liable to perpetual change of form, as new mud-banks were deposited, blocking up the old channels, and leading to the formation of new ones. Besides, it is obvious that the river floods, in forming a domain of alluvial deposits, had to contend with the sea, which washed away the accumulations of mud, or covered them with sand, according to the vicissitudes of weather and season. The soil of the Netherlands shows everywhere the proofs of this struggle between the ocean and the river, in the alternation of salt and fresh water deposits. It also bears evidence to the fact that these changes, effected by the floods of the Rhine or by irruptions of the sea, occurred frequently, long after the country had become inhabited. Remains of forests now lie buried under

the waves of the German Ocean; paved roads, traces of villages and of cultivation, are found beneath the morasses on the banks of the Ems, and many similar proofs can be adduced of great physical changes, respecting which history is silent. It must have become the first object, therefore, of the early occupants of this country to secure the natural permanence of their territorial possessions. For this purpose they had recourse to embankments, high and strong enough to protect them under ordinary circumstances from the waves; and, placing wind-mills on the embankments exposed to the sea-breeze, they worked the pumps which drained the inclosed lands. But this drainage had a consequence which was doubtless not foreseen in the first instance; namely, a general subsidence of the land, which, with the gradual elevation, perhaps, of the beds of the rivers, has made it necessary to increase the original embankments, and to continue the system of embankment to an unparalleled extent. The required skill grew with the gradually developed necessity. The art of the engineer in contending with floods, in constructing dikes and forming beaches, has attained the greatest perfection among the Dutch, who know how to secure important ends by simple means, such as faggots, matting, or the growth of rushes. In short the Netherlands present to our view, at the present day, an artificially constructed country, some portions of which are 16 feet below the surface of the sea, and nearly all too low for natural drainage. The whole country is divided by dikes, some of them 60 feet high, which protect portions of land from the sea, lakes, or rivers. These inclosed lands are called *polders*. On the chief dikes are roads and canals also joining the rivers, and generally large enough to be navigable. There are no mountains nor rocks in the Dutch Netherlands, which are popularly described as a country without mountains, trees (growing wild), or running waters (springs). The only heights are the sand-hills, about 100 to 180 feet high, along the coast of Holland; and a chain of low hills, of similar origin perhaps, which extend from the middle of the province of Utrecht into Gelderland. In the absence of mountains and hills there are of course no valleys; whatever portion of the surface is not marsh, river, or canal, must fall under the denomination of sandy waste, dike, or polder. The work of reclaiming the waste is constantly going forward; in the provinces of North and South Holland alone about ninety lakes have been drained. The principal of these was the Sea of Haarlem, the drainage of which, begun in 1839, was completed in 1852. The draining of a large portion of the Zuider Zee, equal to the county of Surrey, is projected.

The country thus described has an extent, from north to south, of 150 miles; with a breadth from west to east of 120 miles throughout; area, 12,728 English square miles. Its chief features are—the wide estuaries of the Scheldt, and of the Maas, which latter bears off also the waters of the Rhine; north of the Maas the Zuider Zee, which was formed by an irruption of the sea in the beginning of the thirteenth century, and now covers an area of 1200 square miles. Between the mouths of the Maas and the entrance of the Zuider Zee, a distance of 75 miles, the coast is chiefly formed of sand-hills or downs, frequently 180 feet high, dreary and sterile to the last degree; and separating, with their broad band of irreclaimable desert, the low fertile meadows on the one side from the waves of the ocean on the other. In a line with these downs, beyond the mouth of the Zuider Zee, runs a chain of islands, namely, Texel, Vlieland, Schelling, Ameland, &c., which seem to indicate the original line of the coast before the ocean broke in upon the low lands. The coast of Friesland, opposite to these islands, depends for its security altogether on artificial embankments. The Lauwer Zee, a deep bay on the confines of Friesland and Groningen, also owes its origin to an irruption of the ocean; and again the Dollart, a gulf near the mouth of the Ems, north of Groningen, was formed about half a century later than the Zuider Zee, and by a similar convulsion, which is said to have swept away seventy villages and 100,000 people. From the left bank of the Ems the Bourtang morass, an irreclaimable peat marsh, extends about 40 miles south-west towards the Zuider Zee; the Peel, a marsh of like nature but less extent, lies near the left bank of the Maas, on the east side of North Brabant.

Political Limits and Divisions.—The Kingdom of the Netherlands is, at the present day, reduced to nearly the original limits of the Seven United Provinces in the sixteenth century. The provinces now composing the Netherlands, properly so called, are the first ten given in the accompanying table:—

The Provinces of the Netherlands, their Area and Population by the censuses of 1869 and 1879.

Provinces.	Area in sq. m.	Population, Dec. 1, 1869.	Population, Dec. 31, 1879.
North Brabant	1,980	428,872	466,497
Gelderland	1,965	432,693	466,805
South Holland	1,166	688,204	803,530
North Holland	1,057	577,436	679,990
Zeeland	687	177,569	188,634
Utrecht	534	173,556	191,679
Friesland	1,282	292,354	329,877
Overijssel	1,291	254,051	274,136
Groningen	887	225,336	253,246
Drenthe	1,028	105,637	118,845
Limburg	851	223,821	239,453
Total	12,728	3,579,529	4,012,693
Grand-duchy of Luxemburg	987	206,140*	209,570†
Total	13,715	3,785,669	4,222,263

* Population in 1867. † Population in 1880.

Dutch Limburg and the Grand-duchy of Luxemburg were formerly regarded as parts of the German Confederation; but by the Treaty of London, signed May 11, 1867, the former was annexed to Holland, and the latter, although still remaining under the sovereignty of the King of Holland, was declared neutral. The fortifications in the capital of Luxemburg were to be destroyed, and Prussia renounced her former right of keeping a garrison there.

In addition to her European territories the Netherlands possesses a wide extent of colonies and dependencies in Asia and America, with which she carries on an extensive commerce, and which contribute materially to her greatness. Her chief Asiatic colonies are Java, Sumatra, Borneo, Celebes, and part of New Guinea or Papua; while in America she possesses Surinam or Dutch Guiana, and the West Indian islands of Curaçao, Saba, St. Eustatius, &c. Estimated colonial pop. about 25,500,000.

Summary.—*Total Area and Population of the Kingdom of the Netherlands, with the Colonies and Dependencies, excluding the Grand-duchy of Luxemburg:*—

	Area in sq. m.	Population.
Europe	12,728	4,012,693
Asia	630,000	25,419,000
America	60,175	112,000
Total (in round numbers)	700,000	29,544,000

Rivers and Canals.—The chief rivers of the Netherlands are the Rhine, Maas, Scheldt, Ijssel, Vecht, and Hunse. The Rhine is above half a mile wide where it enters the Netherlands; it soon divides, the

south and principal arm taking the name of Waal, and uniting with the Maas, while the north arm, communicating with the Ijssel, takes the name of Leck; a branch from it named the Kromme (crooked) Rhein, winds by Utrecht to the Zuider Zee, while another very diminished stream called the Old Rhine flows from Utrecht by Leyden to the sea at Katwijk. The Old Rhine was formerly choked with sand a little below Leyden; its present channel to the sea is recent and artificial. The Maas, entering the Dutch Netherlands from Belgium, receives the Roer; of the Scheldt only the mouths, the east and the west, or Old Scheldt, lie within the Dutch boundary. The Ijssel and Vecht, flowing from Germany, both enter the Zuider Zee by mouths at no great distance asunder. The Hunse, rising in the Bourtang Marsh, flows through Groningen to the Lauwer Zee. The canals of the Netherlands are collectively more important than the rivers, on which indeed they depend, but they are so numerous as to defy detailed description —every little village having its canals. It will be sufficient therefore to mention only the chief, namely the North Holland Canal, which allows large ships to pass between Amsterdam and the Helder, a distance of 40 miles, so as to avoid the intricate navigation of the Zuider Zee; the Winschoten Canal, also for ships, 18 miles long, connecting the Dollart with Groningen; the Damster-Diep, of equal magnitude, running from Groningen to the sea at Delfzijl; a canal connecting Harlingen, on the Zuider Zee, with Groningen; the Nieuwer Sluis, uniting Utrecht with Amsterdam, while the latter city also communicates with Rotterdam; and another great ship canal, 26 feet deep and 197 wide, from Wijk, on the North Sea, to Amsterdam, and connected by locks with the Zuider Zee, opened in November, 1877. This last canal shortens the distance between Amsterdam and the sea to about 15 miles. A harbour has been constructed at the sea entrance. The Dutch canals are all navigable, and the slowness of the trekschuyts or boats is compensated in some measure by their punctuality. In winter their frozen surface offers convenient roads to skaters, and they are then travelled over with greater speed.

Climate, Agriculture, Produce, &c.—The climate of the Netherlands is, from the maritime exposure and originally marshy character of the country, extremely humid, changeable, and disagreeable; violent winds, with varying temperature, frequently blow from south-west or north-west, and heavy sea-fogs are driven in, which injure vegetation. The mean temperature is not lower than in like latitudes in the British Islands, and the quantity of rain (26 inches) is somewhat less; but the winter is much more severe, and the sky is almost always overcast and troubled. The bright days hardly exceed forty in the year. Low fevers visit the marshy districts in autumn, but the dry cold of winter restores the peasant's health; and although the climate of the Netherlands is to strangers cheerless and distressing, yet its noxious qualities are unable to cope with the countervailing influence of good food and clothing and habitual cleanliness; the Dutch give particular attention to these domestic safeguards, and, notwithstanding the ungenial climate in which they live, longevity is not rarer among them than elsewhere. Gardening and agriculture have attained in the Dutch Netherlands a high degree of perfection. Yet the latter holds a subordinate place in rural industry. Wheat, of excellent quality, is grown only in favoured portions of the south provinces. Rye, oats, and buckwheat, with horse-beans, beet, madder, and chicory, are more common crops; and tobacco is cultivated in the provinces of Gelderland, South Holland, and Utrecht; flax in Zeeland and the environs of Dortrecht, and hemp, oil-seeds, and hops in various parts of the kingdom. Culinary vegetables are cultivated on a much larger scale, not merely for the sake of supplying the internal demand, but also for the exportation of the seeds, which form an important article of Dutch commerce. The flowers also of Holland and adjoining provinces enter into the foreign trade. But it is in stock, and dairy produce in particular, that the rural industry of the Netherlands shows its strength. The Dutch have herein displayed their good sense, that in a humid climate, with only moderate summer heat, they are content to buy wheat, that they may be at liberty to employ their land in a manner adapted to its capabilities. Their horses are remarkable for size and strength, and much sought after; but in the number and excellence of their horned cattle the Dutch are quite unrivalled. The poultry-yard is to the Dutch farmer a source of wealth. Bee-culture is likewise actively carried on. The quantity of cheese and butter brought to market is amazing. The value of the butter exported to the United Kingdom alone in 1882 was upwards of £4,000,000.

Manufactures and Trade.—The Dutch soon became a seafaring people, and Great Britain with its costly railroads and immense commerce is not a more wonderful spectacle than were the seven United Provinces in the seventeenth century, with their dikes, canals, and quays lined with shipping. Manufactures, on the other hand, have never held a very important place, though the linen of the Dutch Netherlands has long held the first rank. The manufacture of woollen cloth centres in Leyden, Utrecht, and Tilburg. The distilleries of Schiedam are well known; Gouda supplies tobacco-pipes, the best of their kind; and the same praise may be bestowed on the leather, the refined sugar of the Dutch, and many other articles intended for continental use. Ship-building and the manufactures subsidiary to that industry are largely carried on in many places. The commerce with the Dutch possessions in the East Indies, particularly Java, is of great and continually increasing importance. The total exports of home produce, and imports for home consumption, inclusive of bullion and specie, in 1880 and 1881, were as follows:—

	Imports.	Exports.
1880	£69,977,000	£52,478,000
1881	76,640,000	57,532,000

The total trade (exports and imports) with Germany in 1881 was valued at £47,240 333, and with Great Britain £33,676,250.

The mercantile navy of the Netherlands on January 1st, 1882, numbered 837 vessels of 40 tons and upwards, 86 steamers of 241,321 tons, and 751 sailing vessels of 615,602; making a total tonnage of 856,923. The number and tonnage of vessels which entered and cleared at the ports of the Netherlands in 1882 are shown in the following table:—

Number of Vessels and their Tonnage that Entered and Cleared at the Ports of the Netherlands in the year 1882.

	Laden.		In Ballast.		Total.	
	Vessels.	Tons.	Vessels.	Tons.	Vessels.	Tons.
Entered	8467	3,937,613	309	72,006	8776	4,009,619
Cleared	4915	2,179,066	3870	1,821,381	8785	4,000,447

The Dutch vessels entered in 1882 were 4153, of 1,132,040 tons; cleared, 2566, of 1,144,620 tons.

Government, Finances, &c.—The Kingdom of the Netherlands, as now constituted, is a constitutional monarchy. The executive power lies wholly with the king, who shares also the work of legislation with the states-general. These consist of two chambers—the upper with thirty-nine and the lower with eighty-six members—who assemble for deliberation and despatch of business at the Hague ('Sgravenhage). The members of the upper chamber are elected by the provincial states from among the most highly-assessed inhabitants of the various counties; the others are elected by ballot, at the rate of one deputy to every 45,000 souls. The government is strong, and the administration in every department is simple and economical. Dutch India is ruled by a governor-general, residing at Batavia, under whom are the governors and residents at the various insular settlements. It is now in the highest degree prosperous, and contributes a large proportion of the national revenue. In the budget of 1883 the revenue is estimated at £9,216,808, and the expenditure at £11,605,497. The debt of the state in 1883 amounted to £83,308,612, the interest on which forms the largest branch of the expenditure. The army maintained consisted in 1883 of 65,000 men in Europe, and about 32,000 in the East; while the navy in July, 1883, comprised 118 steamers (including 23 iron-clads) and 20 sailing vessels. Of the iron-clads 7 are first-class, each having a tonnage of at least 2100 tons.

Railways, the Post-office, and Telegraphs.—At the commencement of 1883 the total length of railways in the Netherlands was 1255 miles, of which 655 miles belonged to the state, and 600 to private companies. The number of post-offices at the commencement of 1882 was 1290; the number of private letters which passed through the post-office in 1882, 59,829,031; the number of post-cards, 18,723,366; the number of newspapers, &c., 42,300,965. The length of telegraph lines in operation on 1st Jan. 1883 was 2566 miles. In 1882, 3,364,612 messages were transmitted.

Money, Weights, and Measures.—The guilder or florin, of 100 cents = 1*s.* 8*d.*, twelve being equivalent to £1 sterling, is the chief denomination of money. The French metric system of weights and measures has been adopted, the principal names being—the kilogram or pond, meter or el, kilometer or mijl, are or vierkante roede, hektare or bunder, stere or wisse, liter or kan, and hektoliter or vat.

Religion and Education.—The members of all religious denominations possess, by the constitution, perfect liberty of conscience and social equality. A majority of the inhabitants belong to the Reformed Church, but the Roman Catholics are numerous. The census returns of 1879 give the number of Calvinists, or members of the Reformed Church, as 2,186,869; of Lutherans, 61,825; of Roman Catholics, 1,439,137; of other Christian denominations, 176,893; and of Jews, 81,693. The Reformed Church is Presbyterian in government, while the Roman Catholics are ruled by an archbishop and four bishops. In respect of education the Netherlands occupy a very high place among the nations of Europe. In 1857 a non-denominational primary instruction law was passed, and in 1878 this law was supplemented by another containing more stringent regulations with the view of making primary education more general. Thirty per cent. of the expense of primary instruction is borne by the state and the remainder by the communes. Intermediate education is provided for by a higher class of schools in all the chief towns; and there is a Polytechnical Institution at Delft, besides various special training colleges at Amsterdam, Leyden, Delft, Breda, and elsewhere. There are three state universities, namely, at Leyden, Utrecht, and Groningen, and to these there has recently been added the municipal university at Amsterdam, which has equally with the other three the right of granting degrees.

Language and Literature.—The literary language of the Kingdom of the Netherlands is in English called *Dutch*, but by the people themselves is called *Hollands h* or *Nederduitsch*, that is, Low Dutch. This name it receives in opposition to the *Hochdeutsch* or High Dutch, the literary language of modern Germany. Closely allied to the Dutch, so closely indeed as to be distinguished from it only by some orthographic and other minor differences, is the Flemish (*Vlaemish*) language, spoken partly in the Kingdom of Holland, but mainly in the Belgian provinces of East and West Flanders, Limburg, Antwerp, and South Brabant. Both languages belong to the Low German group of the Teutonic or Germanic branch of the Indo-European family of languages. The two languages, or rather dialects, are in fact in their early history identical, and the term Flemish is applied, on the one hand, to the original form of both dialects and to the literature produced in it before it separated into these dialects; and on the other hand to that one of the two dialects which is still spoken in the parts above mentioned, and to the literature produced in it. It is only in this latter application of the term that the Flemish language and literature can be noticed separately. The non-literary Low German dialects spoken in the Netherlands may be divided into the Frisian, an idiom which is gradually disappearing (it has a small literature. See FRISIANS); the Guelders dialect, or the so-called Lower Rhenish; the Groningen dialect, to which also belongs the Over-Ijssel dialect, bearing a considerable resemblance to the German.

The common parent of the modern Dutch and Flemish was at one time supposed to be a development of the Old Frisian, but the general view at the present day appears to be that the characteristic forms of the language of the Netherlands are at least as old as those of the Old Frisian, and that both languages are separate developments of a still older original. The Dutch language resembles the German in its vocabulary and syntax, but is considerably simpler in its accidence. Its vowel sounds are broader than those of the German, and its gutturals harsher. It possesses the same power of forming compound words from native materials as the German, and even to a greater extent; for while the German frequently borrows adjectives (for example) from foreign sources to correspond to nouns of native formation, the Dutch has for the most part such adjectives paronymous with the nouns. Thus the Germans may use the word *Wissenschaftslehre* for philosophy, but are obliged to adopt *philosophisch* for philosophical; while the Dutch have *Wijsbegeerte* and *wijsgeerig*, both of native origin.

The oldest literary monument of the language of the Netherlands is, as far as can be ascertained, an ordinance of the town of Brussels dated 1229, although it is possible that a few of the poems which have come down to us, particularly Reinaert de Vos (Reynard the Fox, an edition of which was published in 1874), may belong to the second half of the twelfth century. In the latter part of the thirteenth century the language was brought to a pretty high point of literary cultivation by Jacob van Maerlant (born 1235), author of the Spiegel historical; but not long after his date the language began to decay, owing to the introduction of French forms, words, and idioms through the Burgundian domination (1363–1477). A few literary societies, called Rederijkerskamern,

appear to have striven against this result, but their efforts were not rewarded with any success until the struggle with Spain at the close of the sixteenth century produced a reaction among the population of the Netherlands in favour of their native language, a reaction which, however, proved permanent only in the northern Protestant provinces, which eventually succeeded in throwing off the Spanish yoke, and which now form the Kingdom of Holland. The chief specimens of the language belonging to the period intervening between Maerlant and the reaction at the close of the sixteenth century are the civic laws of Antwerp (1300), a few chronicles such as that of J. Van Clere, and a translation of Boëthius by Jacob Velt of Bruges (fifteenth century).

The leaders in the restoration of the language of the Netherlands, or as we may now call it Dutch, to the dignity of a literary medium were Dirk Volkertszoon Coornhert and Filips van Marnix, both distinguished also as statesmen who took a leading part in all the political and theological conflicts of the day. Coornhert (1522–90) was a poet and dramatist as well as a prose-writer; but while in his poems and dramas he rises little above the Rederijker of his time—of a society of whom at Amsterdam he was himself a member—his numerous prose works are still looked upon as works of merit. Marnix (1538–98), although inferior to the former in purity of language, obtained even greater renown by his Bijenkorf der heil Roomsche Kerche (first printed in 1569, but often since reprinted and translated into foreign languages). One of these two (it is uncertain which) is also the author of the national song Wilhelmus van Nassauwen. The efforts of these men were entirely successful, so that before the final conclusion of peace (1648) the golden age of the Dutch national literature, which fills up the greater part of the seventeenth century, had begun. Energy, independence, vivacity, and elevation of sentiment characterize the more important writers at the beginning of this period, among whom Hooft and Vondel hold the first place. Pieter Corneliszoon Hooft (1581–1647) brought the prose style to a high degree of excellence, and Joost van den Vondel (1587–1679), the greatest of Dutch dramatists, performed the same service for the language of poetry, and made it peculiarly fit for the expression of the sublime. Jacob Cats, familiarly known in Holland as 'Father Cats' (1577–1660), on the other hand, confined himself to the sphere of every-day life. His verses are marked by a careless ease, sometimes even slovenliness; but his language is pure, a circumstance of some importance, since after the termination of the war, when the mind of the people had become toned down from the high pitch to which it had been raised by their struggle for freedom and independence, he became the special favourite of his countrymen, and had thus a large share of influence in determining the character of the national language. Among the other leading names in pure literature belonging to this period are those of Constantyn Huygens (1596–1686), father of the celebrated mathematician, a satirist, epigrammatist, and didactic poet; Jacob van Westerbaan (died 1670) and Jan van Hemskerk (died 1656), both erotic poets, the latter author of Minnedichten, in imitation of Ovid, and also of a poetic romance entitled Bataavsche Arcadia; Dirk Kamphuisen (died 1626), a celebrated hymn-writer. No department of literature received more attention than the drama during this period, and several authors who afterwards distinguished themselves in other fields began their literary career as dramatists. Among these were Brandt (died 1685), who was also an historian and epigrammatist; Ondaan (died 1692), a political writer and lyrist; and Antonides van der Goes (died 1684), celebrated as a lyrist chiefly on account of his poem De Ijstroom, in which he sings the praises of Amsterdam. The principal writer of comedies was Bredero (1585–1618), whose language is that of the lowest of the people.

With the sinking of the national spirit which followed the conclusion of peace the national literature also began to decline, and its decline was hastened by its falling under French influence, to a great extent in consequence of the large influx of French Huguenots after the revocation of the Edict of Nantes (1685). In the crowd of feeble imitators of French originals which the eighteenth century produced in Holland, there are but few that can be singled out either as having kept themselves more or less free from that baneful influence, or as having shown unusual ability in what they performed under it. Among the former are the nature-poet Hubert Corneliszoon Poot (died 1733), the lyrist Jan van Broekhuisen (died 1707), and Pieter Langendijk (died 1756), a writer of comedies; among the latter Lucas Rotgans (died 1710), author of a number of dramas and a tedious epic entitled Willem III.; Arnold Hoogvliet, Sijbrand Feitama, Nicolas Simonszoon van Winter (died 1795), and the brothers Van Haren.

During all this period, however, the language had maintained its purity almost uncorrupted, and again swept itself quite free from foreign taint when the literature took a more healthy development in the last quarter of the eighteenth century. The immediate cause of this change was the occupation of the Dutch with German literature, at that time energetically rising into prominence; and the change was assisted subsequently by their becoming acquainted with English literature, and by the internal commotions and the dangers from without, which quickened the national spirit. The change was first discernible in the lyric poetry. Jacob Bellamy (1757–86) and Rijnvis Feith (1753–1824) show most plainly in this branch of poetry the influence of the Germans, while Pieter Nieuwland (1764–94) formed himself more after the ancients. Willem Bilderdijk (1756–1831), admirably gifted by nature, acquired by study and practice a wide knowledge of literature and a rare command of language, and shone in all departments of poetry, but was unable to breathe into his works any originality, owing to his rigorous adherence to the pedantic rules of Boileau, which prevented his rightly appreciating English and German literature. J. F. Helmers (1767–1813), a poet of more warmth than Bilderdijk, won great applause by the descriptive poem De Hollandsche Natie, in which he glorifies his native country. The pleasing Hendrik Tollens (1780–1856) was as a lyrist the avowed favourite of his country, and his Overwintering der Hollanders op Nova-Zembla is regarded as the best descriptive poem in the Dutch language. Among the others whose productions have met with more or less acceptance are Cornelis Loots, Adriaan Loosjes, Ad. Simons, the original and humorous A. C. W. Staring van den Wildenborch, Bilderdijk's disciple and eulogist Isaak Dacosta, by birth a Portuguese Jew, and J. J. L. ten Cate, an able translator of foreign poetry. An important service was rendered to the literature of his country by Jacob van Lennep (1802–68), who, incited by the example of Scott and Byron, introduced romanticism, and successfully repressed French classicism, by his masterly treatment of native tales and historical subjects in narrative poems. His chief followers are A. Bogaers, H. A. Meyer, B. ter Haar, and N. Beets. The dramatic productions of this period are comparatively insignificant. Prose, which since Brandt had sunk very low in Holland, was first raised again by Justus van Effen in his

Hollandschen Spectator (1731–35), an interesting periodical in imitation of the English Spectator. About the beginning of the nineteenth century Van der Palm, De Borch, Siegenbeek, and others, acquired more or less distinction as historians; but the prose of Holland continued to be characterized by a somewhat strained rhetorical style till it was freed from its fetters by Geel and Van Lennep, the latter of whom wrote novels in language at once refined and popular. The novelists who rank next to Van Lennep are Oltmans (who writes under the pseudonym of Van den Hage), Mrs. Bosboom-Toussaint, and Douwes Dekker (Multatuli), author of Max Havelaar, the most celebrated of recent Dutch novels. Besides these novelists by profession the dramatist Schimmel has done good work in the department of the historical novel, and the poet N. Beets has published under the title of Camera Obscura, a series of sketches and tales illustrative of Dutch life overflowing with wit and humour. The list of recent Dutch prose writers also includes W. A. van Rees, Weitzel, Lange, J. ten Brink, Opzoomer, M. de Bries, and the historians Fruin (called the Dutch Motley) and Hofdijk.

Recent Flemish Literature.—In Belgium, as has been already indicated, the Netherlandish disappeared as a literary language before it had been properly revived, about the end of the sixteenth century, and all efforts to prevent this result were fruitless in face of the severe measures of repression adopted by the Spanish government. It did not re-emerge in literature till the present century, as an indirect consequence of the revolution of 1830. The most active movers in that revolution were not the Flemish part of the population, but the Walloons, who rebelled against the introduction of Dutch institutions and of the Dutch language, which they regarded as identical with the Flemish. It was thus far from being their object to give any assistance to the development of the Flemish, but this very fact brought the more enlightened and patriotic of the Flemish part of the population to put a greater value on their language, and to endeavour to give it increased importance as a literary medium. The leaders in this modern Flemish movement were Willems, Bloomaert, Van Ryswyck, Conscience, Delecourt, Van Duyse, Snellaert, Snieders, De Laet, Dedecker, C. A. Vervier, David, and Bormans. The movement was at first opposed by the Belgian government, which however ultimately gave in. The Belgian Academy likewise in the end gave it its support, and has done good service by encouraging the publication of monuments of the Flemish literature of the middle ages. As has been already stated, the Flemish language, on its reappearance in literature after this inactivity of two centuries and a half, still bears a close resemblance to its Dutch sister. The differences between the two are mainly orthographical and phonetic, and do not pertain to the composition and structure of the languages. The Flemish is more palatal and nasal than the Dutch, and the Dutch more guttural than the Flemish. The literature, at least the pure literature, that has been produced in Flemish since its resurrection is more important than that which has appeared during the same epoch in the language of the adjoining country. The principal authors include most of those above mentioned as being the leaders in restoring Flemish to the dignity of a literary language. From these may be singled out as deserving of especial mention Jan Frans Willems (died 1846), who is venerated by his Flemish-speaking countrymen as the true founder of modern Flemish literature, and Hendrik Conscience, a novelist and writer of tales, extremely popular in his own country, and admired by all who are acquainted with his works in all parts of Europe. To these may be added Tony Anton Bergmann (died 1874), one of whose most remarkable works, Ernest Staas, Advocaat, appeared in the last year of his life; two sisters, Rosalie and Virginie Loveling, writers of tales distinguished for their natural grace and simplicity; and the poets Jan van Beers, a poet of great tenderness and pathos, and a special favourite with the Dutch; De Cort, and Emmanuel Hiel. The principal Flemish periodicals are the Nederlandsch Museum, the organ of the liberal Flemish party, and Het Nederlandsch Toonel, a dramatic review. A literary annual called De Jaarboekje, has appeared regularly almost from the commencement of the movement.

Dutch Science and Scholarship.—The Dutch on the whole can point to higher names in the various branches of scholarship and science than in that of pure literature, a circumstance which is no doubt partly due to the greater ease with which the results of such labours can become known and appreciated in translations than those of pure literature. Gansfort and Agricola in Groningen were among the first who distinguished themselves as divines and scholars. Erasmus of Rotterdam made far greater progress. A still greater genius, Hugo Grotius, in the beginning of the seventeenth century devoted himself simultaneously to philology and antiquities, poetry, history, philosophy, theology, and jurisprudence in all its branches. The northern provinces were long destitute of a university; that of Louvain, in Brabant, served for all the Low Countries. But the University of Leyden, founded in 1575 by Prince William I., soon exerted a beneficial influence over the whole united Netherlands. Men like Scaliger, Lipsius, Daniel and Nicolas Heinsius, Gronovius, Spanheim, Arminius, Drusius, Coccejus, and others, made this university famous over all Europe. Universities were also founded at Franeker in 1585, at Groningen in 1614, Utrecht in 1636, and Harderwijk in 1647, and their competition with the University of Leyden was very advantageous to science. Towards the end of the seventeenth century Huygens, Leeuwenhoek, Zwammerdam, and Hartsoeker distinguished themselves in natural history and astronomy; Alb. Schultens, Tiberius Hemsterhuis, Lambert Ten Kate, and Hermann Boerhaave in medicine; and a series of distinguished men flourished, particularly at Leyden. Utrecht had its Wesseling, Duker, Drakenborch, and Saxe. Among the jurisconsults Mathæus, Huber, Noot, and Voet are distinguished. The cultivation of the Dutch language was especially promoted by Lambert Ten Kate, Sewels, Zeydelaar, Kramer, and Van Moerbeek. In philology, history, geography, mathematics, natural philosophy, and medicine, the Dutch distinguished themselves in the highest degree, and their contributions to civil and public law are very valuable. They have always had men of the first distinction in ancient classical literature. From these notices it will appear that efforts have been made to adapt the language to elevated purposes, and that they have been crowned with success. The prose of the Dutch has little euphony and elegance, but it is well adapted to express practical truths in a simple and popular manner. It would undoubtedly have acquired greater perfection if their philosophical and other writers had not often made use of a foreign language. Erasmus, Lipsius, Grotius, Wyttenbach, and others, wrote in Latin, and Francis Hemsterhuys in French. As with philosophy, so also with history. The sciences have flourished in the northern provinces, and kept pace with the progress of the times; but this is not the case in the southern provinces. The study of the law and of general jurisprudence is in a flourishing condition, and medicine is well cultivated. The

Dutch are well known to excel in mechanics and hydraulics. The orthography of the Dutch language was at one time very unsettled; but a uniform system, proposed by M. Siegenbeek (born 1774), has been adopted in the schools since 1804, though opposed vigorously by Bilderdijk and others. See Otto, Die Gesammtliteratur der Niederlande (Amsterdam, 1838).

Painting.—The painters of the Netherlands may be divided into the Dutch and the Flemish schools. The Flemish school was founded by the brothers Hubert and Jan van Eyck, who established themselves at Bruges, and attracted scholars from far and near. They are believed to have flourished between 1370 and 1445. The Flemish school is distinguished by brilliant colouring; magical effect of the chiaroscuro; carefully laboured, though often tasteless drawing; a strong yet natural expression, and boldness in composition. Among the scholars of the Van Eycks is Hans Memling, an artist whose works are among the best of the early Flemish school. Among later masters of the same school we find Quintin Matsys or Messys of Antwerp (died 1529), Luke of Leyden (died 1533), and wholly in the 16th century Frans Floris (born 1520; died 1570), called, on account of the great influence he exercised on contemporary painting, the *Flemish Raphael.* Among his scholars should be mentioned the two Francks, the two Pourbuses, and Mart. de Vos (born 1520). Other painters rather later in time are Spranger (born 1546); Henry Steenwyk, the painter of perspective (born 1550); Denis Calvart; the brothers Paul and Matthew Bril; Van Ort (born 1557); and the two Pieter Breughels, father and son; Roland Savery of Courtray (born in 1576). After all these came Peter Paul Rubens (1577–1646), the boldest painter of modern times; a man of inexhaustible industry, of gigantic imagination and power of representation, to whom about 4000 paintings are ascribed. With him the Flemish school reached its acme. Several distinguished painters follow: Frans Snyders (born 1579), whose hunting and animal pieces excel all others in boldness and truth; Josse de Momper (born 1580), a landscape-painter esteemed for his valleys and the distant views which they present; Pieter Neefs, the famous church painter; David Teniers, father and son, who in representing companies of peasants, guard-rooms, tap-houses, and all kinds of low life, have hardly their equal; Gaspar de Crayer (born 1582), who approaches in the expression and colouring of his historical paintings to Rubens; Gerard Seghers, distinguished as an historical painter; his brother Daniel, famous for flower and insect pieces. Jakob Jordaens (born 1594), however, excelled all those who made Rubens their model. Abraham Janssen and his pupil Theodoor Rombouts equal Rubens in colouring, but not in conception. The industrious Luke van Uden executed the landscapes for Rubens' paintings, and his views of the sky at dawn are worthy the study of every artist. Anthony Vandyck (born 1599) obtained the name of the *king of portrait-painters.* He excelled Rubens in correctness and beauty of forms. Cornelius Schüt, for whom Jan Wildens often painted the landscapes, distinguished himself as an historical painter; Adriaan Brouwer acquired fame by his excellent representations of scenes from common life; Jan van der Meer by his pastoral pieces; Anton Francis van der Meulen by his battle pieces; Frans and Jan Milet, father and son, by their landscapes. Besides these there are the names of Jan Bol, Wenceslaus Koeberger, Hendrik Goltzius, Hendrik van Balen, Frans Hals, Willem van den Nieuwelandt, Abraham Diepenbeck, Theod. van Thulden, Gerard Lairesse, Jan Frans van Bloemann, Jan van Cleef, Pieter Eykens, Robert van Oudenarde, Jan Anton van der Leepe, Jan van Breda, &c. The Dutch school is distinguished for a faithful copying of nature, great finish, good chiaroscuro, skilful disposition of colours, and delicate pencilling; but it is reproached with choosing often ignoble subjects and with incorrectness of drawing. Its founder is Luke of Leyden (born 1494). Its most prominent artists are Otho van Veen, of Leyden (born 1586; died 1634), who deserves mention also as the teacher of Rubens. Abraham Bloemart of Gorkum (died 1647) painted historical subjects, landscapes, and animals in good taste. Cornelis Poellenburg of Utrecht (born 1586; died 1663) was peculiarly happy in painting small landscapes with figures. Worthy pupils of his are Daniel Vertange and Jan van Haensberge. Johan Wynants of Haarlem (born 1600) is distinguished as a landscape-painter; and Jan Daniel de Heem, of Utrecht (born 1604; died 1674), for his faithful imitation of flowers, fruits, carpets, vases, &c. The highest place belongs to Rembrandt (1606–69), whose masterly colouring atones for all his defects. In the delineation of common life the following are distinguished: Gerard Terburg of Zwoll (born 1608; died 1681); Pieter van Laar (1613–73), the two Ostades, and Jan Steen (1636–89); in landscapes, Jan Both of Utrecht (born 1610; died 1650); Hermann Swaneveld of Woerden (born 1620; died 1690). Asselyn (born 1610; died 1680) painted battles, landscapes, and pastoral pieces with a brilliant colouring and a delicate pencil. Scarcely any painter drew more correctly, coloured more beautifully, and distributed light more truly than Gerhard Dow or Douw (born 1613; died 1680). John Fyt (born at Antwerp, 1625) was a good painter of beasts, birds, and fruits; Gabriel Metzu, who worked in the style of Terburg, excelled him in softness of pencilling. The landscapes of Benenberg of Utrecht are full of life and freshness. Philip Wouvermans (born 1620; died 1668), the most famous painter of horses, produced battle and hunting pieces, horse-markets, travellers, and robbers; and his paintings of all kinds are highly esteemed. The landscapes of Anton Waterloo, for which Weenix executed the figures, are sometimes cold, but please on account of the accuracy with which he represents light playing through foliage, and the reflection of objects in water. Berghem acquired the name of the *Theocritus of painters;* and perhaps Paul Potter is the only one who can dispute the superiority in representing cattle with him. Whilst Ludolf Backhuysen painted storms at sea with an effect as true as it is terrible, Frans Mieris distinguished himself by fine and accurate representations of many domestic subjects, and Jan Pieter Slingeland was hardly less accurate. Godfrey Schalken of Dort excelled in the illumination of night scenes. Excellent market scenes, animals, and landscapes were painted by Karel du Jardin. Albert Cuyp and Adriaan van de Velde painted landscapes and animals with almost unequalled perfection. Hobbema is another excellent landscape-painter. For the representations of the beautiful solitudes of nature Jakob Ruysdael is celebrated, and for quiet lovely moonlight scenes Van der Neer. No painter has painted more delicately and with more finish, even in insignificant trifles, than Adriaan van der Werf. The flower-painters Pieter van Hulst of Dort, and Jakob van Huysum, are almost unrivalled in this department. Other names are Cornelis Ketel, Bartholomew van der Helst, Albert van Everdingen, Gerbrandt van den Eekhout, Hendrik Verschuuring, Maria van Oosterwyk, Willem Kalf, Melchior Hondekoeter, Cornelis de Bruyn, the two Houbraken, Rachel Ruisch, Cornelis du Sart, Jan de Witt, Cornelis Troost, Van Os, Van Spaendonck, Scheffer, Om-

meganck, &c. About the beginning of the present century the classicism of France had a great influence on the Dutch historical school, as seen in the works of Kruseman, Pieneman, Navez, and Van Bree. In genre painting the old models were still followed, and good work was done by Jan Kobell and Eugene Verboeckhoven; Scheefhout and Schotel deserve mention as landscape and marine painters. A more natural and correct style followed the fall of the school of David in France, and Louis Gallait, Edouard de Biefve, Gustaf Wappers, Nicaise de Keyzer, and Hendrik Leys distinguished themselves as historical painters. Florent Willems and Alfred Stevens were genre painters. A. de Kuyff and Xavier de Cock painted excellent landscapes. Among Dutch painters of the present day we should specially mention Alma Tadema and Josef Israels. The former is remarkable for the skill with which he treats subjects selected from states of civilization that have passed away, as from ancient Egypt, Rome, or the Frankish monarchy. His pictures have attracted great notice in exhibitions in this country. The genre pictures of Israels and of Bisschop are also well known. The artists of the Netherlands are still distinguished by the peculiarities of the two schools, the Dutch and the Flemish. The reproach of an almost exclusive adherence to common reality has been often made to the whole school of the Netherlands, but is confined by some to the Dutch; whilst the Flemish school, they say, in its more elevated productions has striven to represent a nobler nature. The chief question in painting, however, is not what the artist attempts, but what he accomplishes; and if critics are right in saying that in the works of the Flemish painters we generally miss the spirit of the poet in the beauty of the manual execution, then the Dutch school would deserve the preference, because, though it takes most of its subjects from common reality, it often represents them with a poetic conception of their character. It would be better, however, to describe them both as deficient in ideal beauty, but as distinguished in the highest degree for faithful imitation of nature. There would still remain sufficient distinction between the two schools. That they both have great merit in respect to the technical part of the art has never been doubted; and that they have greater merits, to a much higher degree than is generally allowed them, will be evident from a careful study.

History.—The southern portion of the Low Countries belonged, in Cæsar's time, to Gaul (*Gallia Belgica*). The northern portion, situated between the Meuse, the Waal, and the Rhine, was called the *Island of the Batavians*, and, with Friesland, formed part of Germany. The part of the Netherlands north of the Rhine was inhabited by the Frisians, who were, as well as the Batavians, a German nation. At subsequent periods they were engaged in commerce and piracy, and were finally overpowered by the Romans. In the fifth century the Batavians, and in the sixth the Belgians, were reduced to submission by the Franks; but the Frisians were not subdued until the seventh century. (See BELGÆ, BATAVIANS, and FRISIANS.) By the Peace of Verdun in 843 (see FRANCE) Batavia and Friesland were annexed to the new kingdom of Germany, and administered by governors who eventually became independent. In the eleventh century the country was divided into duchies, counties, and imperial cities; Brabant or Lower Lorraine, and afterwards Luxemburg, Limburg, and Guelders, were governed by dukes; Flanders, Holland, Zeeland, Hainault, Artois, Namur, and Zütphen, by counts; Friesland Proper remained a free lordship; Utrecht became a bishopric; the secular authority of the bishop extended over Groningen and Overijssel. Of all these rulers the counts of Flanders were the most powerful; and after their possessions had passed in 1383 to the more powerful house of Burgundy, the latter, partly by marriages, partly by force of cession, obtained possession of the largest part of the Low Countries. The last Duke of Burgundy, Charles the Bold, fell in 1477 in battle with the Swiss; his daughter Mary, by her marriage with the Emperor Maximilian, brought the Netherlands to Austria, and Charles V., grandson of Maximilian, born in the Netherlands, united (1548) the seventeen provinces with Spain, by the Pragmatic Sanction, as for ever inseparable from it, according to the rule of primogeniture. From 1512 they formed, under the name of the Circle of Burgundy, an appendage to the German Empire. East Friesland continued, under its own princes, attached to the Circle of Westphalia. Under the reign of Philip II. the Protestant religion spread greatly in the Belgic and Batavian provinces. The rulers of the Netherlands had always respected its privileges and ancient liberties, by which means the country had been rendered prosperous, and had been a source of wealth to the monarchs. But Philip II., born in Spain, treated the distant Netherlands with the greatest severity. By means of the Inquisition all freedom of religious opinion was to be exterminated. These measures excited the wrath of the people; great numbers of industrious artisans fled to other countries, especially to England and Saxony; the nobility conspired in defence of their rights (see GUEUX); and the Protestants publicly celebrated their divine worship with all the defiance of enthusiasm. In 1576 Holland and Zeeland openly rebelled, and in 1579 the five northern provinces — Holland, Zeeland, Utrecht, Guelders, and Friesland—concluded the celebrated Union of Utrecht, by which they declared themselves independent of Spain. They were joined in 1580 by Overijssel, and in 1594 by Groningen. Thus arose the republic of the United Netherlands, afterwards commonly called *Holland*, from the province of that name, which was superior to the others in extent, population, riches, and influence. After the assassination of William of Orange, July 10, 1584, Maurice became stadtholder (governor). His victories at Nieuport and in Brabant, the bold and victorious exploits of the Dutch admirals against the navy of Philip II., the wars of France and England against Spain, and the apathy of Philip II., caused in 1609 the Peace of Antwerp, of twelve years' duration. But Holland had yet to go through the Thirty Years' war before its independence, now recognized by all the powers except Spain, was fully secured by the Peace of Westphalia. While religious disputes distracted the other European states, Holland offered a safe asylum to the persecuted. All religions were tolerated. The continually increasing population found it necessary to seek employment beyond the ocean. Compelled by necessity to make war against the Spanish fleets, the republicans soon became excellent sailors, and enterprising, indefatigable merchants. The commerce of Cadiz, Antwerp, and Lisbon fell into their hands; and in this way the United Netherlands were, in the middle of the seventeenth century, the first commercial state and the first maritime power in the world, and for a long time maintained the dominion of the sea. From the time of Maurice and Barneveldt the two leading parties (the Orange and the patriotic or the anti-Orange) had gradually assumed various shades of opinion. Religion was brought into play: the strict Calvinists were, in general, Orangists; those of other opinions, patriotic; thence the frequent political convulsions, caused sometimes by the encroachments of some stadtholders, sometimes by popular commotions, and which were always preceded by an arbitrary administration of government, or unsuccess-

ful wars. The dignity of stadtholder was made hereditary in the male and female descendants of William IV., who presided over the United Provinces till the end of the eighteenth century, when the wars of the French revolution broke out. Belgium, conquered by the French (1792 and 1794), was ceded to them in 1797 by the Peace of Campo-Formio. When the victorious banners of France waved (1794) on the frontiers of Holland the so-called patriots rose. Pichegru made an easy conquest of Holland. The hereditary stadtholder fled with his family to England, and the Batavian Republic was formed, May 16, 1795. The old provinces were merged into a sole republic; the legislative power, in imitation of the French, was given to a representative assembly, and the executive to a directory of five. The new republic was obliged to cede to France some southern districts, particularly Maestricht, Venloo, Limburg, and Dutch Flanders; to form a perpetual alliance with that state; pay a sum of nearly half-a-million sterling, and allow French troops to occupy its territories. Six years after it was found necessary to alter this constitution (Oct. 18, 1801), and the republic was again divided into the old provinces. For the third time the Dutch constitution was changed (April 29, 1805), but so stormy and troubled were the times that to avoid utter ruin it was deemed expedient to incorporate Holland altogether with the French Empire. This measure, long meditated, was accomplished in 1806. The brother of the emperor, Louis Napoleon, received possession of Holland as a sovereign kingdom, and, June 5, 1806, he was proclaimed King of Holland. But not long after he lost the friendship of his brother. The misunderstanding increased, and Louis, not to involve the country in his personal difficulties, or produce a war with France, voluntarily and unexpectedly abdicated the crown in favour of his eldest son, a minor, July 1, 1810. Napoleon did not, however, sanction his brother's measures. July 4, French troops occupied Amsterdam, and by the imperial decree of July 10, 1810, Holland was incorporated with the French Empire. But this state of things continued only till the end of 1813. Napoleon's defeat at Leipzig produced a change in the fate of Belgium and Holland. The Prince of Orange, who was residing in England, was invited over (November 19). He arrived at the Hague November 30, where, after spending a day, he proceeded in December to Amsterdam. William accepted the nomination to the sovereignty only on the condition that his power should be restrained by the constitution. He governed the country, by the title of 'Sovereign Prince,' till 1815, when, by a resolve of the Congress of Vienna, the Belgic provinces were united with the United Netherlands, to form the Kingdom of the Netherlands, and William I. was recognized by all the powers as sovereign king of the Netherlands. But the want of a common feeling between the Belgian and Dutch subjects of the new monarchy was strongly displayed on several occasions. Both nations disdained to bear the common name of the state of the *Netherlands*. This reciprocal aversion of the northern and the southern people was several times exhibited with great animosity in the church, in the army, and even in the chambers of the states-general; and in 1830 the ill-assorted Kingdom of the Netherlands was broken up by the Belgians revolting from their allegiance, and forming themselves into an independent state. The relations with Belgium were for a long time hostile, but peace was finally concluded between the states in 1839. In the following year national discontent was loudly expressed, and fears were entertained of dangerous commotions. William I. therefore abdicated in favour of his son, William II. The revolutionary fever by which the Continent was fired in 1848 spread to the Netherlands, and a new constitution was granted by a royal decree of 14th October, and solemnly proclaimed on 3d November. The two chambers of the states-general were to act conjointly with the king in exercising the legislative power; but they had scarcely met when the king died, March 17, 1849. He was succeeded by his son William III., the reigning monarch. The nation has for many years enjoyed peace and prosperity. Slavery has been abolished in the West Indian possessions of the Netherlands and in Surinam, compensation being allowed to the slave-owners. The law came into force 1st July, 1863. The budget of that year provided £1,065,366 as extraordinary expenses connected with the emancipation of the slaves. A difficulty arose with Prussia by the king's agreeing in 1867 to sell Luxemburg to the Emperor of the French. The fortress of Luxemburg, as one of the frontier defences of the German Confederation, was garrisoned by Prussian troops. A French ownership of the territory was therefore, in the circumstances, inconvenient if not impracticable. The king was willing to resile from his engagement, but this France would not permit. Complications were imminent, but a conference of the European states that sat in London arranged a treaty, by which the King of the Netherlands was to retain Luxemburg, the fortress was to be evacuated and dismantled, and the neutrality of the duchy guaranteed by the other powers. In 1873 the Dutch, taking advantage of the rescinding of a treaty with Britain by which they were prevented from making conquests in Sumatra, began a war against the Acheenese to punish them for piracy. The war has been carried on without decisive result for several years, and even now (1884) the country can scarcely be said to be completely pacified. See COLONY, JAVA, SUMATRA, &c., and STADTHOLDER.

NETHERLANDS TRADING COMPANY, a limited liability chartered association, instituted by King William I. in 1824 to aid the development of the natural resources of Java. The capital was fully three millions sterling, to which the king was not only a large subscriber, but guaranteed 4 per cent. on the paid-up capital, the whole of which interest he had to pay in 1830. Since then the affairs of the company have prospered, and it has been the means of realizing large surpluses for the national exchequer from the profits of its trade with Java. Peculiar privileges are possessed by it, and it acts exclusively as the agents of the government in all import and export transactions with the East India colonies, the sales being effected on what is called the consignation system. The sales of colonial produce are chiefly of coffee and tin. The principal factory is at Batavia, but it has agencies at the chief Javanese ports, as well as at the ports of the other possessions of the Netherlands in the Eastern Archipelago. By far the greater part of the trade with Java is done by the company, which receives a commission from government, which is not fixed, but arranged privately at intervals according to circumstances. The company's affairs are flourishing, the shares at a premium, and the dividends average a high per centage. Complaints have been made that the practical monopoly enjoyed by one favoured company is unjust to the general merchant; but the Dutch merchants and capitalists, when they had the trade in their own hands, failed to develop satisfactorily the natural resources of Java, and the establishment of the Netherlands Trading Company was a necessity, and has proved a national benefit.

NETLEY, ROYAL VICTORIA HOSPITAL AT, was erected in 1855, near to Southampton, for the reception of invalids from the army on foreign service,

and from the troops quartered in the military districts in the neighbourhood. A large portion of the hospital is generally untenanted, but circumstances might arise when its capabilities would be strained to the utmost, as in the case of a great European war in which Britain was involved. The accommodation is for 1000 patients, but it is capable of being increased. The medical staff in attendance is always proportioned to existing exigencies, but is always large and well appointed. Candidates for medical appointments in the army attend the medical school attached to the hospital, in the wards of which there are always opportunities for acquiring practical instruction to qualify them for their future duties. The female army-nurses have also their head-quarters here, and receive adequate instruction under proper control. In the event of a war ample and judicious arrangements have been made in front of the hospital for landing wounded men, and for conveying them to the wards with the least possible aggravation of their sufferings. The site being in the vicinity of the extensive mud-banks of Southampton Water, which are exposed at low tide, its salubrity has been called in question.

NETTING, Naval, net-work of rope or small line for the purpose of securing hammocks, sails, &c. *Boarding-netting* is a stout netting extended fore and aft from the gunwale to a proper height up the rigging for the purpose of preventing an enemy from boarding. In presence of the enemy during the night and at other times when attempts at boarding are anticipated ships are protected in this way. *Splinter-netting* is stretched from the mainmast aft to the mizzenmast in a horizontal position about 12 feet above the quarter-deck. It secures those engaged there from injury by the fall of any objects from the mastheads during an action. The *hammock-netting* in the bulwarks of a ship, generally in the waist, is the receptacle for the hammocks and beddings of the sailors during the day. Thus netted together it is a valuable bulwark against musketry from an enemy's ship. *Hatchway-netting*, formed of strong thick rope, usually of inch rope, are stretched over open hatchways during fine weather to prevent sailors or passengers from falling through.

NETTLE (*Urtica*), a genus of plants belonging to the natural order Urticaceæ, and consisting chiefly of neglected weeds, having opposite or alternate leaves, and inconspicuous flowers, which are disposed in axillary racemes; the fruit is a small seed, surrounded by a persistent calyx; the flowers are monœcious, or, in a few instances, dicœcious. The species are mostly herbaceous, and are usually covered with extremely fine, sharp, tubular hairs, placed upon minute vesicles, filled with an acrid and caustic fluid, which by pressure is injected into the wounds caused by the sharp-pointed hairs. Hence arises the well-known stinging sensation when these plants are incautiously handled. In Great Britain this stinging is of but little consequence; but in some tropical species it is followed by exceedingly painful and even dangerous effects. The fibre of the *U. dioica*, the common nettle, both in Europe and America, resembles that of the hemp, and may be obtained in the same manner. Fine cloth and paper have been made from it, but hitherto it has not been extensively manufactured. The natives of Kamtchatka make cordage and fishing-tackle from another species. *Boehmeria nivea* yields the beautiful fibre known as Chinese grass, and is cultivated for textile purposes in China and India. There are three species of nettle in this country, namely, *Urtica pilulifera*, or Roman nettle, the most venomous of the British species; *U. urens*, the small nettle; and *U. dioica*, the common nettle. The last two species have been naturalized in North America, where there are other two indigenous species. In Scotland the common nettle in a young state is sometimes used as a pot-herb.

NETTLE-RASH, or Urticaria (Latin, *urtica*, a nettle), the term applied to a common disease of the skin. It is an eruption closely resembling nettle-stings, both as to appearance and as to the sensations it originates. It consists of wheals, either red or white, sometimes both, having the centres white and the margins red. The disease may be either acute or chronic. When it is acute generally more or less of fever accompanies it. In almost all cases it arises from a disordered condition of the digestive organs, produced either by indigestible food, or in some persons by particular kinds of food, which others eat with complete impunity. The kernels of fruit or seeds, such as almond, peach, &c., which contain prussic acid, develop this disease in some persons. Fish, especially shell-fish, such as oysters, mussels, and crabs; some fruits, such as strawberries, cucumbers, and mushrooms; certain medicines, such as turpentine; teething, hurry and agitation of mind in adults, and other causes of irritation have a tendency to produce nettle-rash. The remedy is to remove offending matters from the alimentary canal. When sickness supervenes an emetic should be given, and in all cases an aperient. Indeed vomiting and diarrhœa often act as a natural cure. Acid in the bowels often accompanies the condition, and hence there is a necessity for the use of some antacid, generally magnesia with rhubarb, followed by castor-oil. The chronic form is exceedingly troublesome, and has been known to continue for many years. It is always beneficial in this disease to attempt to improve the condition of the digestive organs. External remedies are seldom of much avail, but Dr. Watson recommends that the itching surface should be dusted with flour, which may afford temporary relief. A still better application is a lotion composed of a drachm of carbonate of ammonia, the same quantity of sugar of lead, and half an ounce of laudanum in half a pint of distilled or rose water.

NETTLE-TREE (*Celtis*), natural order Urticaceæ, a deciduous tree, with simple and generally serrated leaves, much resembling those of the common nettle, but not stinging. It has a sweet, drupaceous fruit, fleshy, globose, or subglobose, and one-celled. The Common or European Nettle-tree (*C. australis*) grows to the height of 30 or 40 feet, and is frequently used as an ornamental tree to line public walks in the south of France and north of Italy. The wood, used in coach-making and in the construction of musical instruments, is susceptible of a high polish. The young branches are boiled and the infusion used as a remedy for dysentery and blenorrhœa; the fruit is sweetish and somewhat astringent; and the kernel yields a useful oil. *C. occidentalis*, sometimes called the sugar-berry, is a much larger tree, often attaining a height of from 60 to 80 feet. It is a native of North America, from Canada to Carolina. Its drupes are administered in the United States in dysentery. A variety, *C. crassifolia*, is often called hackberry. (See Hackberry.) From the inner bark of *C. orientalis*, which consists of reticulated fibres, some Indian tribes form a kind of natural cloth. The root, bark, and leaves are somewhat aromatic, and are employed among eastern nations as a remedy for epilepsy.

NEU-BRANDENBURG, a town of Mecklenburg-Strelitz, situated on Lake Tollens, and 17 miles N.N.E. of Neu-Strelitz. It is the largest and most beautiful town in the duchy, is regularly built, and occupies the centre of a picturesque district. It has on a rock overlooking the lake the ducal palace of Belvedere, commanding, as its name implies, a beau-

tiful prospect; several churches; a castle; and manufactures of tobacco, chemical products, playing cards, cottons, and woollens. Pop. (1880), 7476.

NEUBURG, a town of Bavaria, in the circle of Swabia, capital of a district, on the right bank of the Danube, here crossed by two bridges, one of wood, and another, very handsome, of stone, 45 miles N.N.W. of Munich. It is a place of great antiquity, and very picturesquely situated; and consists of the town proper, divided into the old and new town, and partly surrounded with old walls, and of two suburbs; is the seat of several provincial courts and offices; contains an old turreted castle of the dukes of Bavaria; three churches, a convent of the order of Mercy, an old Jesuit college, town-house, gymnasium, Latin school, seminary, infirmary, hospital, barracks, and arsenal; and has manufactures of porcelain, cloth, and saltpetre; numerous breweries and distilleries. An active fishery is carried on. On an island formed by the river are the ruins of the Castle of Altenburg. Pop. 7690.

NEUFCHÂTEL, NEUCHÂTEL (in German *Neuenburg*), a Swiss canton, bounded by France, Vaud, the Lake of Neufchâtel, and Bern, with an area of 312 English square miles. Neufchâtel was an independent principality as early as 1034. After various changes of masters it came into the hands of the old French family of Longueville (1504), which became extinct in 1707 by the death of Mary of Orleans, duchess of Nemours. The King of Prussia, as heir of the house of Orange, whose claims to the principality were acknowledged, was then called to the sovereignty by the States of Neufchâtel, and his title was confirmed by the Treaty of Utrecht. In 1806 Prussia ceded it to France, and the emperor conferred it on Marshal Berthier, afterwards Prince of Neufchâtel-Wagram. By the Peace of Paris it was restored, with additions, to Prussia. The king granted it a constitutional charter, dated from London (January 18, 1814), with the privilege of forming a separate state, still, however, maintaining his title as Prince of Neuenburg, and his prerogatives as such. In 1814 the principality was received into the Swiss Confederacy, and was the only canton with a monarchical government, which it preserved till 1848. In that year, in consequence of a demonstration of the republican party, the monarchy was abolished, and a new republican constitution framed. This was sanctioned by the confederacy, and adopted by the people in spite of the protests of the King of Prussia, who subsequently (May, 1857) renounced all his rights in Neufchâtel, and even his title of prince. Several ridges of the Jura run through the country. The Lake of Neufchâtel (Neuenburgersee), 24 miles long by 8 broad, is plentifully supplied with fish, and communicates with the Rhine. Grazing is extensively attended to; wine, fruits, hemp, and flax are produced; the corn raised is not sufficient to supply the wants of the inhabitants, for which large additional supplies are drawn from the cantons Bern and Basel. The dairy is perhaps the most important branch of rural economy. The manufactures are more important; the principal are lace, cotton, and clocks; a considerable trade is also carried on in cutlery, mathematical and philosophical instruments, chintz and other cotton stuffs. There are about 12,000 watchmakers here, whose instruments are used over all Europe and in America. France, notwithstanding her efforts to prevent it, annually receives vast numbers of them contraband. (See CHAUX DE FONDS, LA.) The religion is Protestant (Reformed). The language is French; but German is also spoken. Neufchâtel furnishes 960 men to the army of the Swiss Confederacy. Pop. (1880), 103,372.

NEUFCHÂTEL, NEUCHÂTEL, or NEUENBURG, a town, Switzerland, capital of the canton of same name, 24 miles west of Bern, on a steep slope above the north-western shore of Lake Neufchâtel, and traversed by the Seyon, which falls into the lake immediately below. The town rises in the form of an amphitheatre, and is well built, containing several good streets, particularly the Rue de l'Hôpital and Rue de Faubourg. The principal buildings are the castle, an ancient, open building, of considerable extent, originally the residence of the princes of Neufchâtel; the old Gothic church adjoining the castle, built in the twelfth century, containing several curious ancient monuments, and surrounded by a magnificent terrace, on which William Farel, Calvin's favourite colleague at Geneva, was buried; the new church, a handsome edifice in modern style; the town-house, a large building, with a Grecian portico, used, among other purposes, for the meetings of the Grand Council; the gymnasium, with an interesting museum, and a celebrity almost European, in consequence of the distinguished labours of Agassiz, a native of the town, and one of its professors; Pury's Hospital, so called after its founder, David Pury, a native, who amassed a fortune of about £160,000, and left the whole to the town for its general improvement and benevolent purposes; and the Pourtales Hospital, so called because founded by another benevolent native. Neufchâtel is the entrepôt for the manufactures of the canton, and carries on an extensive trade, for which both good roads and water communication afford great facilities. Steamers navigate the lake, and communicate with Morat, Yverdun, &c. Pop. 15,612.

NEUHAUS (Latin, *Nova Domus*), a town, Bohemia, circle of Tabor, 26 miles north-east of Budweis, on the Nezarka. It has a ruinous old castle, with a large donjon tower; three churches, a town-house, theatre, barracks, gymnasium, hospital, and manufactures of woollen stuffs. The palace of Count Czerny is a magnificent edifice. The high table-land in this neighbourhood forms the water-shed between the basins of the Elbe and the Danube. Pop. (1880), 8703.

NEUILLY, a town in France, department of Seine, finely situated along a magnificent avenue crossing the highroad to Paris, near the right bank of the Seine, which is here crossed by a magnificent bridge of five arches, each with a span of 120 feet. Its magnificent château was the favourite residence of the late Louis Philippe, and its fine grounds are a great holiday resort of the Parisians. Its manufactures are waterproof articles, fecula, and chemicals. Pop. (1881), 25,235.

NEUMÜNSTER, a town of Prussia, province of Schleswig-Holstein, 17 miles S.S.W. of Kiel, on the railway to Altona. It is a large, well-built, manufacturing place; has a church in the Italian style; and important manufactures of linen, one factory employing 900 hands. Pop. (1880), 11,623.

NEURALGIA, the name given to that species of morbid pains which occur only in the course of one or more distinct nerves, and by this locality are distinguished from other pains. In neuralgia of the fifth nerve the pain is in one half of the face, and if the central branch is affected the pain is confined to the upper jaw; neuralgia of the front nerve of the thigh (*sciatic nerve*) extends along the inner side of the upper thigh down to the knee, and is called *sciatica;* and that of the back nerve of the thigh (*ischias postica*) extends from the hip down to the ankle and sole of the foot; while neuralgia of the intercostal nerves manifests itself in a belt or circle of pain around the breast. In addition to these principal means of diagnosis, which are furnished by anatomical position, and never fail except when adjoining trunk nerves become sympathetically affected, genuine neuralgias are usually known by the following

symptoms:—the attacks of pain are incomparably keener and more acute than those which the patient suffers generally or from other local causes; they come in periodical fits, leaving him in the intervals either altogether free from pain or only very slightly and bluntly affected; they are produced by causes which affect the nervous system, for example, mental emotions; or, which are comparatively unimportant, for example, a slight rubbing of the skin; while, on the contrary, causes apparently more powerful, for example, strong pressure on the locality itself either produces no pain or sensibly diminishes it. The presence of neuralgia almost invariably indicates a weak state of the general system. In very many, though not in all neuralgias, we perceive a symptom, first discovered by Valleix, namely, that pressure on the trunk of the affected nerve, where it either issues from the cavity of a bone or passes through a sinewy skin, produces a vivid sensation of pain throughout the whole course of the affected nerve. It may, moreover, happen that the very spot where pain is thus so strongly produced by pressure is insensible to any other external act, such as pricking, pinching, &c. The most common and best ascertained of the neuralgias are those of the nerves of the skin (*dermalgia*), but they occur also in other parts, as in the joints (*myalgia*) and in the bowels (*enteralgia*). Many of the internal parts may be the seat of similar local affections, such, for example, are nervous affections of the heart and respiratory organs, which, however, do not usually manifest themselves by acute pain but by special symptoms. Of this sort is the very alarming affection known by the name of *angina pectoris*. The primary causes of the injury to the nerve producing neuralgia may be very various. It may be inflammation of the nerve itself, a swelling in or upon it, irritation of it produced by an ulcer or suppuration or swelling of the adjacent parts, especially the cavities of the bones, &c. A central disease of the brain or of the spinal marrow may produce neuralgia, as in a case of softening of the brain caused by the poison of lead. The affection may also be produced by a kind of nervous reflection, as when the irritation of a nerve in a remote part is conveyed to the centre of the nervous system and thence transferred to other nervous seats. Thin-blooded persons and those of weak nerves are most liable to be affected by neuralgia, which varies much both in degree and duration. It is often chronic, and often suddenly occurs during the progress of other acute diseases, as in typhus or intermitting fevers. The treatment also of course varies with the nature of the different cases, some admitting of easy cure, while others are incurable. See Valleix, Traité des Neuralgies; Bretschneider, Pathologie und Therapie der äussern Neuralgien; and the works on nervous diseases by Swan, Descot, and Romberg.

NEURAPOPHYSES, or NEURAL ARCHES, the name applied to the upper or superior arches which spring from the body of the typical vertebra, or segment of the vertebrate spine, and which by their union form a canal—the 'neural canal'—inclosing the spinal marrow. The point of union of the neurapophyses is generally prolonged to form a spinous process, termed accordingly the 'neural spine.' And the neural arches in the typical vertebral segments also bear articular processes termed 'zygapophyses,' by means of which part of the one segment articulates or unites with the neighbouring vertebra.

NEUROPTERA, an order of Hemimetabolic Insects (or those which undergo an incomplete form of metamorphosis) distinguished by the possession of four well-developed membranous wings, which are generally of equal or nearly equal size. The name Neuroptera ('nerve-winged') is applied to the group, in allusion to the large size of the nervures (which see) or supporting 'ribs' of the wings, which are very conspicuous, and give to the wings a reticulated or net-work like appearance. The mouth is generally masticatory in structure. No sting exists in this order. The larvæ are active, provided with hooked and six-jointed legs, and rarely possessing soft fleshy 'prolegs.' The head is generally large, and distinctly separable from the thorax. The antennæ are generally of slender conformation. The tarsi possess from two to five joints. In some Neuroptera the metamorphosis may approach very nearly to the characters of the Holometabolic or 'complete' variety. In general the larvæ are aquatic in habits; the pupa, in the majority of cases, closely resembling the perfect insect. The Neuroptera are usually active in habits; and many of these forms, from their carnivorous tastes and powerful organization, become the petty tyrants of the insect domain. The chief families included in the order comprise, firstly, the *Libellulidæ* or Dragon-flies, well known to most readers, and distinguished by the large wings, masticatory mouth, the short, non-articulated caudal appendages, by the antennæ being composed of from six to eight joints; and by the large size of the compound eyes. The larvæ and pupæ are aquatic, the empty pupa-skin from which the perfect form has emerged being frequently seen attached to the stems or leaves of aquatic plants. The pupa possesses a peculiar prehensile apparatus attached to its mouth, consisting of a jointed process bearing two mandibles or jaws. This apparatus can be protruded at will for the prehension of the insects upon which the larva feeds, and when applied close to the head of the larva it resembles a 'mask,' which name has accordingly been given to it. The Dragon-flies are exceedingly voracious in habits. The French name them 'Demoiselles,' probably from the elegance of their flight; but the English name of 'Horse-stingers' is erroneous, as these insects possess no offensive apparatus, such as this name would indicate. The family of Caddis-flies (*Phryganeidæ*) evince in their metamorphosis a near approach to the perfect series of changes of other insects. The larvæ are aquatic, and appear as soft, fleshy grub-like creatures, possessing six legs, and inclosing themselves within the familiar 'cases,' formed of small fragments of pebbles, pieces of sticks or straws, and other heterogeneous materials. These substances are joined together by delicate threads, which these larvæ manufacture. The imago possesses four wings; the hinder pair being folded when at rest. The mouth-organs are of undeveloped nature. The antennæ are elongated; and the eyes are well-developed. The familiar species is the *Phryganea grandis*. The members of the May-fly family (*Ephemeridæ*) possess small hinder wings; rudimentary mouth-organs; elongated jointed tail-bristles; three-jointed antennæ; large compound and three simple eyes or 'ocelli.' The larva and pupa are aquatic, and breathe by gill-plates situated along the sides of the abdomen. The perfect insects present a brilliancy of colour and hues on leaving the pupa-state; and whole swarms of these forms may sometimes appear in a district, after liberation from their pupæ-cases—a process generally occurring in the evening. The *Ephemera vulgata* is the familiar 'May-fly' of the angler; and the name 'ephemeral,' applied to transient things, has been given to these forms in allusion to the short duration of their lives—a few hours marking the limit of existence to their imago or perfect state. The *Psocidæ* are a family of minute Neuroptera, recognized by their small labial palpi and hind-wings; and by the tarsi being two or three jointed. Of this group the *Atropos pulsatorius*, or 'Death-Watch'—so named from its habit of

beating or tapping with its head on wood, and of thus causing a sound fraught with terror to the superstitious—is an example. The 'Death-watch,' however, is wingless. The *Perlidæ* or 'Stone-flies,' of which family the *Perla bicaudata* of the angler is a familiar form, possess slender antennæ, large hinder wings, and a pair of long tail-appendages. The tarsi are three-jointed, and the mouth-organs are of rudimentary nature. The maxillary and labial palpi are, however, of large size. The *Myrmeleontidæ*, or 'Ant-lions,' possess short clubbed antennæ, and long labial palpi. The wings are of large size, and when at rest are extended upon the sides of the body. No ocelli or simple eyes are developed. In their larval state they possess powerful jaws, and excavate pitfalls, in which they lie in wait for other insects, on which they prey. From these habits the popular name of 'Ant-lions' has been derived. The *Hemerobiidæ*, or 'Aphis-lions,' are of delicate conformation, and possess soft bodies and large wings, and elongated antennæ. The larvæ of these forms subsist on the *Aphides* or plant-lice—insects which infest and destroy plants. They are chiefly nocturnal in habits, and some species are said to emit a disagreeable odour when touched. The *Panorpidæ* possess a 'rostrum' or beak-like process on the front of the head, and at its lower portion. The antennæ are elongated. The caudal or tail appendage is of pincer or forcep like conformation. The 'Scorpion-fly' (*Panorpa*) is a familiar representative of this group. The *Raphidiidæ* and *Mantispidæ* are collectively known in a popular sense as 'Snake-flies'—a term applied to them in allusion to the elongated nature of the prothorax, or first of the three thoracic segments. The family of the *Termitidæ*, represented by the celebrated 'White-ants' or Termites of tropical regions, forms the last division of this order which may in the present instance be noticed. These insects are to be very carefully distinguished from the true or ordinary ants, which are Hymenopterous insects, and are included in that order along with the Bees, Wasps, and allied forms. The Termites resemble the common ants in some degree, in that they live in social communities, and exhibit many extraordinary examples of an instinct approaching, in its results at least, very nearly to the higher or reasoning powers of more highly organized animals; but in structure, in metamorphosis, and in other points of their economy, they are true Neuropterous insects, and as such are perfectly distinct from their more familiar neighbours which are described in the article ANT. The 'termitarium,' or white ant-abode, which in many instances attains a height of over 5 feet, is formed of particles of earth worked into a solid mass by the ants. The entrance is generally situated at some distance from the nest, with the interior of which it communicates by means of a covered passage. Internally the structure exhibits a division into chambers and communicating galleries—and a single termitarium may comprise within its limits several colonies of distinct species of Termites, each of which inhabits a distinct portion of the mound, and contributes its share to the erection of the whole dwelling. The colony consists of a king, a queen, sexless workers, and soldiers. The two latter classes may be distinguished from the time of their development from the egg. They are wingless throughout their existence. The workers tend the young, and perform all the duties of the colony, whilst the soldiers, with powerful mandibles or jaws, serve in the protective or offensive interests of the termitarium. The king and queen, as the representatives of the sexual and reproductive phases of the colony, are guarded by the workers. They are wingless in their mature state—the queen Termite being found when in the termitarium in a gravid or pregnant state, distended with eggs. The eggs, as produced, are taken charge of by the workers, and are conveyed to the chambers appropriated to their development. Winged males and females are produced at the beginning of the rainy season, and these fly from the hive, pair, lose their wings, and enter upon the sexual relationship, through which they become the parents of new colonies and swarms. In the organization of such a colony, and in the perfect discharge and routine of the many duties, a degree of order, regularity, and precision is witnessed, which may, even to the scientific mind, with a knowledge of the automatic nature of these acts—(see NERVOUS SYSTEM)—cannot fail to excite both wonder and interest. Many distinct species of these insects are known to entomologists, and they attain their highest development in tropical regions—such as Central America, Africa, and Asia. In Mr. Bates' work entitled The Naturalist on the Amazons, a full and interesting account of the Termites will be found. (Pl. LXV.–LXVI.)

NEUSATZ, or UJ-VIDEK, a town in Hungary, district of Bács, on the Danube, opposite to Peterwardein, with which it communicates by a bridge of boats. It was taken by storm during the civil war in 1849, by the imperial troops under Jellachich, and almost destroyed by the fire of the insurgents from the castle of Peterwardein. It has since revived, through its trade with Germany and Turkey. Pop. (1880), 21,325.

NEUSIEDLER SEE (anciently, *Lacus Peiso*), a lake in the extreme west of Hungary, between the counties of Oedenburg and Wiesselburg; greatest length, north to south, 23 miles; average breadth, 5 miles; circuit, about 60 miles. It is salt and very shallow throughout; greatest depth seldom exceeding 15 feet; on the east side it is lost in the great morass of Hansag. Large quantities of salt crystallize on its shores in summer, consisting of a mixture of common and of glauber salt. It contains abundance of fish, such as carp and pike, some of the latter being 70 or 80 lbs. weight. Its frequent inundations used to occasion great damage, till a canal was cut in 1800, of sufficient width to carry off its superfluous waters at all times, and discharge them into the Rabnitz or Little Raab. The water has several times disappeared from it entirely. The last occasion was between 1865 and 1870, when crops were grown on its bed.

NEUSOHL, a walled town in Hungary, capital of the county of Sohl, on the right bank of the Gran, 79 miles north of Pesth. It has a central square adorned with a statue and a handsome fountain, five churches, an old castle, a bishop's palace, extensive beet-root sugar factories, and various other industrial establishments. Copper and iron are wrought and smelted in the vicinity. Pop. 7159.

NEUSS, a town in Rhenish Prussia, 21 miles north-west of Cologne, on the Erft, near its junction with the Rhine. It is inclosed by a fosse and by walls flanked with towers, and has a Protestant and five Roman Catholic churches, a synagogue, an ordinary, orphan, and lunatic asylum, and extensive woollen and other manufactures, foundries, tanneries, dye-works, vinegar-work, worsted, cotton, and other mills. Pop. (1880), 17,495.

NEUSTADT, numerous places in Germany.—1. *Neustadt-an-der-Hardt*, a walled town in the Palatinate of Bavaria, 14 miles west of Spires, with an important trade in wine and wood. Pop. 11,411.—2. *Neustadt* or *Prudnik*, a walled town in Prussia, 29 miles s.s.w. of Oppeln, with a Protestant and three Roman Catholic churches, a synagogue, and manufactures of cloth, tanneries, paper, and other mills. Pop. 14,292.—3. *Neustadt-Magdeburg*, a suburb of Magdeburg. Pop. 27,090.—4. *Neustadt-*

Eberswalde, a town in Prussia, 28 miles north-east of Berlin. It is of an oval form, and consists of three parts—Eberswalde-am-Berge, Neustadt-in-der-Ebene, and the suburb of Kienwarder. It has manufactures of iron and steel, delft and stoneware, woollen and linen cloth, copper and iron mills, and a considerable trade. Pop. (1880), 11,524.

NEU-STRELITZ, the capital of the Grand-duchy of Meklenburg-Strelitz, between Lakes Zierk and Glombeck, 57 miles north of Berlin. It is surrounded by walls; is regularly built in the form of an octagon, with several good streets and squares; as the seat of government contains several superior courts and offices; and has a large and handsome ducal palace, partly in the Doric, and partly in the Italian styles, with a library of 70,000 vols., and some good collections; another palace, belonging to Prince Ernest; two churches, a college, gymnasium, and several superior schools, two hospitals, a poorhouse, a theatre, and a bathing establishment. Most of the inhabitants are connected with the court or the military service, but there are iron-foundries and machine-shops, saw-mills, oil-works, breweries, and three mills. Neu-Strelitz occupies the site of the ancient fort of Lunkin or Lienke, demolished in the beginning of the tenth century. Pop. (1880), 9407.

NEUSTRIA, in the geography of the middle ages, the western kingdom of the Franks, in the north of France, so called in opposition to *Austrasia* (Austria, Oestreich), the eastern kingdom of the same. The term is derived from the negative particle *ne* (not), and *Austria*. On the death of Clovis (511) his sons divided his territories into two parts, which received these names. Neustria lay between the Meuse, the Loire, and the ocean. See FRANCE.

NEUTER, a term applied in zoology to indicate those beings—represented chiefly among the Ants, Bees, and Wasps—in which the characteristics of sex are either present in a rudimentary condition or may not be developed at all. Thus among the Ants the community consists of males, females, and neuters or 'workers,' as they are also termed. These Ant-neuters are simply (sexually) undeveloped females, and upon these forms the performance of all the laborious duties of the ant-colony devolves. Among the White Ants or Termites (see NEUROPTERA) the wingless neuters exhibit a division into two groups—ordinary workers and 'soldiers'—the latter being provided with large mandibles or jaws, and their duties being embodied in the defence and protection of the community. In the Bees the neuters, or workers, are similarly sterile females. A very high degree of interest has become attached to the question of these relative sexual differences in such organized colonies of insects, and also as regards the production of these differences. Thus the queen-bee, or single fertile female, forms the sole source for the production of impregnated ova. She is impregnated in the 'nuptial flight,' the male element then received being stored in a special receptacle within her body. This 'seminal receptacle' is placed in communication with the oviduct or efferent tube of the ovary, through which the eggs pass on their way to be deposited. Those eggs from which the future 'queens' or fertile females and 'workers' are to be developed are allowed to come in contact with the seminal fluid from the receptacle; whilst the eggs from which drones or males are to be produced are allowed to pass from the oviduct without contact with the male element, and are thus not fertilized. This latter result was experimentally tested and proved by preventing the escape of the male fluid stored up in the receptacle, and in such a case the eggs invariably developed into males or drones. The differences between the fertile females and neuters—both of which are developed from fertilized ova—appear to be produced through differences in the food upon which the respective larvæ are fed, and through similar and surrounding circumstances which affect the nutritive development of the larvæ. Plenty of food is thus said to produce females, and a scantier or different dietary males or neuters. Leuckart ascertained that if a worker-larva be fed upon 'royal food'—composed of a special 'paste'—it is developed into a queen or fertile female, through the full growth of its sexual organs. Landois has similarly proved that a generous dietary influences the production of female bees from larvæ. The full question of such developments, and their bearing upon other and related subjects, will be discussed in the article on PARTHENOGENESIS (which see).

NEUTER, in grammar. See GENDER and VERB.

NEUTITSCHEIN, or NOWY-GYCIN, a town of Austria, Moravia, circle Prerau, 26 miles east of Olmütz. It has a district criminal court, several public offices, three churches, one of them an ancient edifice in the Byzantine style; an old castle, a town-house, a high, a female industrial, and a primary school; an infirmary, almshouse, city hospital, and asylum for widows; extensive manufactures of woollen stuffs, which form important articles of trade. The sulphur spring of Sommeraw is in the neighbourhood. Pop. (1880), 10,274.

NEUTRA (*Nyitra*), a town in Hungary, capital of a county and on the river of the same name, 70 miles north-west of Pesth. It has a castle situated on a height, and containing within its inclosure a cathedral and bishop's palace. Pop. (1880), 8660.

NEUTRALITY (from the Latin *neuter*, neither) means, in the law of nations, that state of a nation in which it does not take part, directly or indirectly, in a war between other nations. To maintain itself in this state a nation is often obliged to assume a threatening position, to be able to repel, in case of necessity, every aggression on the part of either of the belligerents. Such neutrality is termed an *armed neutrality*. From the state of neutrality arise certain rights and obligations towards the belligerents. A neutral nation is allowed to render any services to either of the belligerents which do not necessarily tend to assist him in carrying on hostilities. It must not send him troops, arms, or ammunition. It cannot refuse to one what it has allowed to the other; for instance, the right of marching through its territory, supplies of provisions, &c. With either of the belligerents the neutral nation has the right to conclude treaties, if they are not intended to aid the belligerent in the war, or do not necessarily presuppose a war. As, however, in war force is the main arbiter, it is most advisable for a neutral power to conclude special treaties of neutrality, in which the rights and duties of the neutral power are settled, as it may be easily imagined that there will be always many disputed points between it and the belligerents. These doubtful points are chiefly the following:—Whether the neutral state can allow the belligerents loans, commerce, and even the right of enlisting troops; what goods are to be considered prohibited; whether they can be seized; whether a passage through its territory is to be permitted to the troops of the belligerents; how the unlawful requisitions of one of the belligerents are to be opposed; what security is to be given on this account; the compensation to be rendered if hostilities are committed in the neutral territory, &c. In maritime wars the treatment of effects of the enemy on board neutral vessels, or neutral effects on board a hostile vessel, gives rise to very important questions. (See CONTRABAND.) In former times the principle was pretty generally admitted, that the ownership of the

goods on board of the vessels was the only point to be considered, and not the property of the vessels themselves. The belligerents, therefore, seized merchandise belonging to the enemy on board of neutral vessels; but they restored neutral property seized under the enemy's flag. But the endless investigations which this system caused, as a consequence of it was the searching of neutral vessels, produced by degrees a new and totally contrary principle, that the flag protects the cargo (*la pavillon couvre la marchandise*), so that merchandise of the enemy under a neutral flag was safe, but neutral merchandise under a hostile flag was good prize. This principle, since the middle of the seventeenth century, was adopted in several treaties, particularly between France and other governments. Great Britain, however, wished to enforce the former principle in the war with her colonies in North America. The Empress Catharine of Russia, on the other hand, declared in 1780 that she was willing, if necessary, to enforce by arms the new principle, 'free ships, free goods.' This principle formed the basis of the system of the armed neutrality in which France and Spain joined with Russia, and to which also Denmark, Sweden, Holland, Prussia, Austria, Portugal, and Naples acceded by separate conventions with Russia. Britain opposed it; yet she was obliged, several times, tacitly to admit the principle. In the French revolutionary war, and the hostilities between Britain and Napoleon, the former returned entirely to the old principle. (See CONTINENTAL SYSTEM.) The plenipotentiaries of Great Britain, Austria, France, Prussia, Russia, Sardinia, and Turkey, assembled at Paris, 16th April, 1856, agreed to the following declarations on this subject:—1. Privateering is and remains abolished. 2. The neutral flag covers enemy's goods, with the exception of contraband of war. 3. Neutral goods, with the exception of contraband of war, are not liable to capture under enemy's flag. 4. Blockades, to be binding, must be effective, that is to say, maintained by a force sufficient really to prevent access to the coast of the enemy. The president of the United States acceded to these propositions in 1861. The arbitration at Geneva of the *Alabama* claims of the United States against Great Britain, which decided against Great Britain on *ex post facto* rules agreed to between the parties to the arbitration, is as yet a precedent of doubtful authority in regard to the duties of neutrals, as it is uncertain how far the rules then agreed to will be held binding by other governments. The three rules are to the effect that a neutral government is bound to use due diligence to prevent the fitting out in or departure from any of its ports of a vessel which it has reasonable ground to believe is intended to carry on war with a power with which it is at peace; that it is bound not to permit a belligerent to make use of its ports as a basis of naval operations, or a source of recruitment of men or military supplies; that it is bound to exercise due diligence in its own ports or waters, and as to all persons within its jurisdiction to prevent any violation of these duties and obligations. It was agreed by the parties to the arbitration that these rules should be held binding between them for the future.

NEUTRAL SALTS. See SALT.

NEUWIED, a town of Prussia, province of Rheinland, 7 miles north by west of Coblenz, on the right bank of the Rhine, here crossed by a flying bridge. It is built with great regularity, in the form of a square, the streets crossing each other at right angles; and contains a palace, surrounded with extensive gardens, and possessing a collection of Roman antiquities, chiefly obtained from the buried city of Victoria, 2 miles north of the town; and a library of 10,000 volumes; a building called Fasanerie (Pheasantry), containing a museum of natural history; a casino, with a musical society, a progymnasium, normal, industrial, infant, ragged, and numerous other schools and private educational establishments. It has manufactures of tobacco, chickory, articles of *vertu*, furniture, soap, candles, cotton goods, pipes, mineral colours, piano-fortes, bells, lacquerware, morocco leather, and clay stoves; and a trade in wine, iron, ironware, potash, and pipe-clay. Neuwied was founded in 1649 by a prince of the name, then independent, who invited settlers of all religious persuasions, with the assurance of perfect toleration. The state of the times made the terms valuable, and the town, accordingly, soon attained considerable importance. A variety of sects now live together in harmony. The most interesting establishment of all is that of the Moravian brethren, who here amount to about 400 individuals. They have excellent schools, which are attended by many English children. Pop. (1880), 9656.

NEVA, a river of Russia, which issues from lake Ladoga, and after a westerly course of about 40 miles, flows into the Gulf of Finland, below St. Petersburg, by several mouths. It is from 300 to 400 yards wide, and 10 or 15 feet deep, and of course navigable for vessels of considerable size. It is generally frozen over from October to April. Its commercial importance is greatly enhanced by canals, which connect it with remote parts of the empire.

NEVADA, one of the United States, which was formed out of the western part of Utah and some districts of California. Its boundaries are, on the north, the 42d parallel, on the east the meridian of 116° W. and the river Colorado, on the south or southeast, a straight line stretching from the Colorado at lat. 35° to the meridian of 120° at lat. 39°, which meridian is the western boundary. It borders with Oregon, Idaho, Utah, Arizona, and California. The area is 110,700 square miles. It is rather mountainous, having the slopes of the Sierra Nevada in the west, and several other groups, such as the Humboldt River Mountains, Diamond Mountains, Shoshone Mountains, &c. There are several salt lakes, including Lakes Walker, Carson, and Pyramid. The chief river, besides the Colorado, is the Humboldt River. The rivers lose themselves in the soil or enter the salt lakes. Much of the state is very arid, but it includes tracts such as the charming Carson Valley, rich both in vegetation and mineral wealth. The principal industry of the state up to this time is mining. Rich deposits of gold and silver have been opened, and agate, opal, amethyst, cornelian, and other fine stones are found in abundance, and marble of great value is known to exist. Solid masses of salt of great purity are abundantly found in many places. The produce of the silver mines is by far the most important source of wealth to the state. In 1881 the total value of the silver produced was about £1,412,000; the total production from the discovery of the metal in 1859 being valued at £16,245,400. The Central Pacific Railway passes through the state, which at the end of 1882 had in all 947 miles of railway open for traffic. The capital is Carson, but Virginia is the largest town. Pop., in 1870; 42,491; in 1880, 62,266.

NEVERS, a town of France, capital of the department of Nièvre, on the right bank of the Loire, at the confluence of the Nièvre, 153 miles S.S.E. Paris. It is built in the form of an amphitheatre on the slope of a hill, and has a very picturesque appearance when viewed across the river. It is the see of a bishop; and has a cathedral, a somewhat heavy building; the church of St. Étienne, in the Romanesque style; an old castle, now used by the courts of

justice; a Hôtel de Ville, formerly the residence of the dukes of Nevers, in the flamboyant style; a college, founded in 1525; public library, barracks, and prefecture; a court of first resort and commerce, a consulting chamber of manufactures, a central society of agriculture, science, and art; a diocesan seminary, secondary ecclesiastical school, and communal college; manufactures of coarse woollens, metal buttons, and other articles in metal; violin strings, articles in beads, vinegar, glue, and candles; numerous potteries, producing ware which has been famed for many centuries; bottle-works, breweries, tanneries, roperies, machine-works, and an extensive shell foundry, at which, in addition to other castings, about 400 pieces of ordnance are annually made. The trade includes most of the above manufactures, and also timber, wine, salt, &c. Pop. (1881), 23,846.

NEVIS, or NIEVIS, a small island of the British West Indies, belonging to the Leeward group, and lying on the south-west extremity of St. Kitts, from which it is separated by a channel 2 miles broad. It is a beautiful spot, and little more than a single mountain, which rises 2500 feet from the sea. The whole island is about 24 miles in circumference; area, 24,640 acres. It is of volcanic origin. It is well watered, and in general fertile, producing much sugar, which, with molasses and rum, forms the sole export. The principal town is Charleston. Pop. (1881), 11,864.

NEW. For names beginning with this adjective not given here see the articles under the name which follows it.

NEW ALBANY, a city, United States, Indiana, Floyd county, on the right bank of the Ohio, which supplies its numerous factories with water-power. It is regularly laid out; has numerous public buildings, including a court-house, jail, and many churches; several schools, a lyceum, a theological college, &c. Steam-boat building is extensively carried on, and there are also large iron-foundries, rolling-mills, woollen factories, machine-shops, &c. Pop. in 1880, 16,423.

NEW ARCHANGEL. See SITKA.

NEWARK, a city and port of entry in the United States, the capital of Essex county, New Jersey, 9 miles west of New York city, with which it is connected by four railway lines. It is finely situated on the west side of Passaic River, about 4 miles from its mouth in Newark Bay. It is the largest city in the state, and is built chiefly on a plain terminated on the west by a ridge of land. It is regularly laid out with wide straight streets, generally intersecting at right angles. Broad Street, the principal street, is one of the finest streets in America. It is more than 120 feet broad, shaded with elms, and divides the city into two nearly equal parts. Near its centre it is intersected by Market Street, another fine street. There are several beautiful squares adorned with majestic elms. Among the public buildings are the court-house, a large building in the Egyptian style; the library buildings, one of the finest edifices in the city; the academy, the opera-house, several of the banks and insurance offices, large hotels, the custom-house and post-office, the city-hall, &c. There are many fine churches, several of them especially remarkable for their lofty and graceful spires. Newark is distinguished as a manufacturing town, the goods manufactured including chiefly furniture, machinery and castings, leather, boots and shoes, saddlery, oil-cloth, hardware, clothing, india-rubber goods, &c. There is a considerable coasting trade and constant steam-boat communication with New York. Pop. in 1870, 105,059; in 1880, 136,508.

NEWARK-UPON-TRENT, a parliamentary and municipal borough of England, in Nottinghamshire, on the right bank of an eastern branch of the Trent, here crossed by a handsome bridge of seven arches, 17 miles north-east of Nottingham, at the junction of the Great Northern and Nottingham and Lincoln Railways. It is pretty well built, with a spacious market-place in the centre; and has a town-hall, containing public offices, and an assembly-room; a large and elegant cruciform church, recently restored, places of worship for various other denominations; free library (founded 1883); hospital, hostelry, a free grammar-school, several sets of alms-houses and other charities. The principal trade is in malt and flour. There is also a linen manufactory, iron-foundry, agricultural implement works, and large breweries. The Trent navigation is still made largely available for traffic in connection with the Hull and Grimsby inland trade. On the north-west of the town are the ruins of an ancient castle, rebuilt in the reign of Stephen. It returns two members to Parliament. Pop. in 1871, 12,195; in 1881, 14,018.

NEW BEDFORD, a town in the United States, Bristol county, Massachusetts, 55 miles south from Boston, on the Acushnet, which falls, about 4 miles below, into Buzzard's Bay. It presents a commanding and beautiful appearance, is well built, and has a large and handsome town-hall of granite; a commodious custom-house, also of granite; a court-house, several handsome churches, a library, a Friends' academy, and several other schools. The river is here crossed by a fine bridge about 4000 feet long. New Bedford has extensive cotton factories, iron and copper works, cordage factory, oil and candle works, Prussian-blue works, shoe factories, &c. It was at one time the centre of the American whale-fishery, but this industry has much declined. Pop. (1880), 26,845.

NEW BRUNSWICK, a province of the Dominion of Canada, on the east coast of North America; bounded west by the state of Maine; north-west by the province of Quebec, from which it is separated by the River Ristigouche; north by Chaleur Bay; east by the Gulf of St. Lawrence and Northumberland Strait, the latter separating it from Prince Edward's Island; and south by the Bay of Fundy and part of Nova Scotia; area, 27,174 square miles, or about the same extent as the mainland of Scotland. Its coast-line is about 540 miles in length, interrupted only at the point of junction with Nova Scotia, where an isthmus of not more than 14 miles in breadth connects the two territories, and separates the waters of Northumberland Strait from those of the Bay of Fundy, and which it is proposed to unite by means of a canal. The most remarkable bays and harbours are Bathurst Bay, on the north coast; Miramichi Bay, on the east coast; Passamaquoddy Bay and St. John Harbour, on the south coast. There are, besides these larger indentations, numerous smaller harbours, particularly on the south portion of the east coast.

The general surface of the country presents a series of bold undulations, sometimes rising into mountains or continuous ridges of high land. The latter are seldom of any considerable height; but their precipitous acclivities, sharp outline, and deep ravines give them an alpine and picturesque character, that finely and strikingly contrasts with the rich valleys and sheltered plains which alternate with the more rugged scenery. The shores of the Gulf of St. Lawrence and Northumberland Strait, however, present different and far less pleasing features. There the land for about 12 miles inland is low and sandy, covered with trees of a stunted growth, and skirted with extensive marshes, large deep mosses, and long sand-beaches. New Brunswick is watered by numerous rivers. The principal are the St. John, 450 miles in

length, and navigable for vessels of 100 tons to Fredericton, 90 miles from its entrance into the Bay of Fundy; the Miramichi, 225 miles in length, which falls into the bay of the same name, and is navigable for large vessels 25 miles from the gulf; the Ristigouche, 200 miles in length, and 3 miles wide at its entrance in Chaleur Bay. The largest lakes which are in the south of the province are Grand Lake, 25 miles long by about 5 miles broad; and Washedemoak Lake, about 20 miles long by 2 miles broad, both lying between St. John and Fredericton. Along the shores of Chaleur Bay and the Gulf of St. Lawrence gray sandstone and gray clay-slate predominate, with detached rocks of granite, quartz, and iron-stone; on the south coast, limestone, clay-slate, with sandstone, interrupted occasionally by gneiss, trap, and granite. Specimens of amethyst, carnelian, jasper, &c., have been picked up in various places. Coal is plentiful, and iron-ore abundant; the former is said to extend over 10,000 square miles, or above one-third part of the whole area of the province. Copper and manganese also abound. Gypsum, limestone, and freestone abound. Salt springs, strongly saturated, are numerous; and some sulphureous springs have also been discovered. The climate of New Brunswick, like that of other portions of the North American continent, is subject to extremes of heat and cold. The severest cold of the winter usually continues from December 21 to March 21. The prevailing summer winds are from the w.s.w. and s.; when from the south-west dense fogs are often produced on the shores of the Bay of Fundy, and stretch 15 miles to 20 miles inland. In the interior the climate is said to have been greatly ameliorated in consequence of the clearing away of the forests, by which the sun's rays are permitted to reach the surface of the earth, where the heat thus absorbed is again diffused by radiation. It is stated, as a result of this process, that the winters are reduced to nearly half their former duration. The climate is, on the whole, healthy; and the autumn, as in other parts of the North American continent, is a season of exceeding beauty, the air being dry and clear, and the woods glowing with innumerable tints of the richest and most brilliant hues.

The chief vegetable product of New Brunswick is timber, of which there is the usual variety found in North American forests; but the pine is the chief timber exported. Indian-corn is grown in the south parts of the province; flax, wheat, and other cerealia; and good potatoes are raised. The wheat of New Brunswick is of the very best quality, and is said to be much heavier than that of the United States. Turnip cultivation has been introduced of late years with great success. The great extent of its coast, with its numerous deep bays, coves, and inlets, affords great scope for the pursuit of the fishing trade, which has not, however, been pursued with the vigour its importance merits. The exports of fish are only exceeded by Nova Scotia among the provinces of the Dominion of Canada. Ship-building is carried on to a considerable extent, chiefly at St. John. The principal articles of export are fish, iron, salt, lath-wood, deals, battens, planks, boards, shingles, staves, timber, and other sorts of wood. Imports: beef, pork, beer, ale, books, brass and copper manufactures, bread, biscuit, cider, coffee, copper, cordage, corn, grain, wheat-flour, Indian and other meal, cotton, linen, silk, and other manufactures, earthenware, fishing-tackle, glassware, gunpowder, haberdashery, hardware, hemp, hides, iron, leather, medicines, oakum, linseed, painters' colours, rice, soap, rum, spirits, sugar, tallow, tea, snuff, tobacco, wines, &c. The value of the imports from beyond the Dominion considerably exceeds a million sterling; more than half is from Great Britain, and less than one-fourth from the United States. The exports are about equal to the imports. The amount of shipping registered in the province on December 31st, 1881, was 1087 vessels, of 333,215 tons. St. John is the chief port. The province contains five railways, having (including branches) a length of nearly 500 miles in operation.

The chief part of the inhabitants of New Brunswick are British settlers and their descendants. There are a few inhabitants of French stock, who are principally settled on the Chaleur Bay; and there is a small number of Micmacs, Melicetes, and other Indians in the north part of the province. New Brunswick is divided into fourteen counties, in each of which are several schools—grammar and parish. The Church of England, the Established and Free Churches of Scotland, Reformed Presbyterian, Wesleyan Methodist, Baptist, Congregationalist, and Roman Catholic Churches, are all more or less extensively represented. The affairs of the province are administered by a lieutenant-governor, aided by an executive council consisting of nine members, a legislative council of eighteen members appointed for life, and a house of assembly of forty-one representatives of the people. The province sends twelve members to the senate, and fourteen to the house of commons of the Dominion parliament. The judicial department comprises a supreme court, with a chief and four puisne judges; a court of chancery, one of marriage and divorce, and one for the trial of offences committed at sea; over these three courts the lieutenant-governor presides. New Brunswick was first settled by the French in 1639, and it continued, along with Nova Scotia, to form part of Acadia or New France, till it fell into the hands of the British after the conquest of Quebec. The first British settlers in New Brunswick emigrated from Scotland to Miramichi in 1764; and in 1784 New Brunswick was separated from Nova Scotia, and formed into a distinct province. In 1826 the standing timber in the district around Miramichi Bay took fire, and enveloped an area of 6000 square miles in flames, consuming four thriving towns, many large vessels lying in Miramichi River, and destroying 500 human beings. In 1867 New Brunswick became a province of the Dominion of Canada, of which, as regards population, it is the fourth largest. Pop. (1871), 285,594; (1881), 321,233.

NEW BRUNSWICK, a city, United States, Middlesex county, New Jersey, on the Raritan, which here becomes navigable, the Delaware and Raritan Canal, and the New Jersey Railroad, 29 miles south-west of New York. It consists of an older portion, situated on a flat along the bank of the river, and composed of narrow, crooked streets; and of a more modern portion, occupying a declivity, regularly and spaciously built, and presenting a handsome appearance, many of the houses being surrounded with gardens, and commanding beautiful views. The principal buildings are Rutger's College, possessed of a library of 10,000 volumes, and attended by more than 200 students; the Theological Seminary of the Dutch Reformed Church, with a library of 7000 volumes and about 40 students; twenty churches, several schools, a court-house, and jail. The manufacturing establishments include several large factories; and the trade of the port, which admits vessels of 100 tons, is considerable. Pop. in 1880, 17,166.

NEWBURY, a municipal borough in Berkshire, England, 45 miles east of Bath, and 52 miles west of London. It is situated on a branch of the Great Western Railway, and on the Kennet, which is made navigable to Reading, and joins the Thames. It has wide and well-paved streets, a spacious market-place, municipal buildings (opened 1877), a church of the time of Henry VII., and a corn-exchange (built 1862). There are silk and paper mills, and a trade in corn and

malt. Near this town two obstinate battles were fought between the Royalists and the forces of the Parliament, King Charles being present at both of them; the first, September 20, 1643, and the other, October 27, 1644. Pop. in 1881, 10,144.

NEWBURYPORT, a town in the United States, Essex county, Massachusetts, about 3 miles above the mouth of the Merrimac, and 30 miles north-east of Boston. It is regularly built, partly on terraces rising from the river; and has several churches, in one of which the celebrated preacher Whitefield is buried; and a custom-house of rough granite with a Doric portico. The harbour, though somewhat obstructed at its entrance by a sandbank, is spacious and safe; many vessels are employed in the cod and mackerel fisheries, and the trade, both coasting and foreign, is considerable. Pop in 1880, 13,538.

NEWCASTLE-UNDER-LYME, an ancient market town and a municipal and parliamentary borough of England, Staffordshire, close to the Potteries, and 19 miles N.N.W. of the town of Stafford. It stands on the slope of two hills on the line of the North Stafford Railway from Stoke to Market Drayton. The streets, though irregular, are well paved and lighted; and the houses, which are of brick, are well built, and many of them large and handsome. It has a good town-hall, covered market, theatre, alms-houses, union workhouse, and cemetery; two Established churches, seven Dissenting chapels, and a fine Roman Catholic church. Newcastle possesses large endowments for educational purposes, which have recently been dealt with by the Education Commissioners, who have started a rather comprehensive scheme of education, including a semi-classical or high school, and also a middle school for boys, with one of a similar character for girls. There are also other efficient schools, and a school of art. The chief manufactures are silk, cotton, paper, and leather; while hat-making, formerly the staple industry, is now extinct. A good trade is also done in corn and flour. Coal and iron works are carried on to a great extent in the neighbourhood, giving employment to a large number of the inhabitants. Newcastle sends two members to Parliament. Pop. in 1881, 17,508.

NEWCASTLE-UPON-TYNE, a municipal and parliamentary borough, river-port, and (since 1882) an episcopal city, in the county of Northumberland, but forming a county in itself. It stands on the north bank of the Tyne, about 9 miles from its mouth, and 303 miles by railway from London. It occupies the sides and summits of three acclivities, which rise steeply from the river, and extends about 2 miles along its bank. Fragments of the walls and towers with which it was formerly surrounded are still to be seen, but the fosse has been filled up. In the older portions the streets are narrow and winding, and the houses of an irregular and often very antique appearance, but owing to the extensive improvements which have been effected in recent years many of the streets have been completely modernized. In the newer parts are many handsome streets and squares, of which Grey Street and Grainger Street are among the finest; while suburbs of villas have spread in all directions, and more especially in the west. The most important public buildings are the cathedral of St. Nicholas, an ancient Gothic structure (restored by Sir G. Scott, 1873–76); the church of All-Saints, a handsome Grecian structure; the church of St. Andrew, a very ancient structure; the church of St. John, of ancient date and large dimensions, with some interesting monuments; the church of St. Peter, an elegant modern building; the church of St. Thomas, in the early English style; the Roman Catholic church and cathedral of St. Mary, a modern building in the early English style; the town-hall, a handsome modern edifice; the central exchange, Art-Gallery, and News-room, forming a spacious semicircular Ionic building; the Guildhall and Exchange beneath it, the Merchant's Court, the corn exchange, the assembly-rooms, the Moot Hall, in which the assizes for the county are held; the castle, one of the finest specimens of castellated Norman in England, recently restored; the Central Railway-station, an imposing building; the jail and house of correction; the Mining Institute, the public library (opened 1882), a savings-bank, two theatres, &c.; public baths and several commodious markets. The High Level Bridge is one of the greatest engineering achievements of the late Robert Stephenson. It consists of six arches, each having a span of 125 feet, with two curved approaches 66 feet in length, the whole being formed of cast-iron pillars and arches. Above is a viaduct for the railway, underneath (85 feet above high-water mark) a passage for foot passengers and goods traffic. It affords ready access to the borough of Gateshead. About half a mile to the west another high-level iron bridge has been erected. A new low-level stone bridge, with a swing-bridge for the inlet and outlet of vessels, was opened in June, 1876. Among the literary and other institutions are the Free Grammar-school, and many other schools; the Northern Counties Institution for the Deaf and Dumb; Northern Counties Orphanages; the College of Medicine and Surgery; the College of Physical Science, in connection with Durham University, recently instituted; the Mining Institute, a chaste but handsome building opened in July, 1872, and affording accommodation to the chiefs of the coal and iron industries of the north of England; the Literary and Philosophical Society, occupying a handsome Doric building, in which are a museum and library; the infirmary, the Victoria Blind Asylum, the Hospital of St. Mary Magdalene, and several other hospitals and charitable endowments. We may also mention the Natural History and Antiquarian Societies, both with valuable collections; the Botanical and Horticultural Society, and the government school of design, and institution for the promotion of the fine arts.

Within the town, or in its immediate vicinity, are numerous blast-furnaces, and important malleable and other iron works. Hardware and large castings, locomotive and other machinery, are made at numerous large establishments. There are here also immense chemical works. The other manufactures of importance are earthenware, glass, sheet and pipe lead, cordage and cables, painters' colours, soap, railway and other carriages, brassware, patent shot, bricks and tiles, paper, sailcloth, &c.; while the extensive works of Sir W. G. Armstrong & Co., at Elswick, for the manufacture of ordnance, afford employment to a large number of men. There are also flax spinning-mills; flour, bone, oil, and saw mills; and extensive building-yards, at which great numbers of sailing vessels and steamers, both in wood and iron, are constructed. The coasting and export trade, especially in coal, is very important. In 1882 there were 5,358,802 tons of coal shipped over sea, and more than 2,945,000 shipped coastwise, independent of an immense quantity sent by railway. The total value of exports from Newcastle was £4,597,700; imports, £7,650,085; gross amount of customs received, £372,482. The total number of vessels that cleared from Newcastle for foreign and colonial ports was 7281, having an aggregate burden of 3,290,094 tons; the total number entered, 4883, with a burden of 2,000,318 tons. In the coasting trade (the returns do not give Newcastle apart from North and South Shields) 10,152 of 3,377,108 tons entered, and 8214 of 2,361,248 tons cleared. During the past few years vast improvements have been

made on the river by the Tyne commissioners, and all the way between Shields and Newcastle there is now a depth of 19 feet at low water. (See TYNE.) The deepening of the river has necessitated the rebuilding of Newcastle quay. The inland trade is very important, and has in recent times been greatly augmented by the different railways. There are large corn and cattle markets, and, among the general horse and cattle fairs, one held in October lasts for eight days.

The town of Newcastle is situated at the eastern termination of the wall of Hadrian, and Roman antiquities have been repeatedly discovered in it. In the Anglo-Saxon period the town was called Moncaster, or Monchester. The monks by whom it was then inhabited deserted it in consequence of the incursions of the Danes. The fortress was built by Robert, son of William the Conqueror, about 1080, about which time it received its present name. It received a charter from King John, but the oldest extant is said to be by Henry III. in 1229, which confers the right of digging for coal in the neighbourhood. The coal trade had attained some importance by 1280. Newcastle was a frequent object of attack, and was repeatedly taken in the wars between England and Scotland. It was also the scene of repeated conferences between English and Scottish monarchs and their representatives. It furnished seventeen ships to Edward III. for the siege of Calais. It was taken possession of by the Scottish Covenanting army in 1640 and in 1644, and in 1647 Charles was delivered here by the Scottish army to the parliamentary commissioners. In 1715 and 1745 precautions were taken against an assault by the Pretender's army.

Newcastle returns two members to the House of Commons. The borough is divided into nine wards; and the municipal government is vested in a mayor, sixteen aldermen, and forty-eight councillors. Pop. of municipal and parliamentary borough in 1871, 128,443; in 1881, 145,359.

NEWCASTLE, N.S.W., the principal shipping port of New South Wales, after Sydney, situated at the mouth of the Hunter River, in Northumberland county, about 75 miles north-east from Sydney, on ground rising somewhat steeply from the sea. It is a well-laid-out and progressive town, and has a substantial court-house, a hospital, a lunatic asylum, a grammar-school, several churches, a custom-house, market building, theatre, and numerous fine shops and hotels. It is the southern terminus of the Great Northern Railway, which connects it with the northern towns. Two lines of steamers regularly ply between Newcastle and Sydney. It is the see of a bishop of the Anglican Church. In the surrounding district there is a large coal-field with no less than sixteen seams, of which the one at present worked is from 5 to 12 feet in thickness. The quantity of coal raised in the district in 1881 amounted to 1,328,565 tons. New mines are being opened, and the shipping facilities are being increased. Pop. (1881), 15,595.

NEW COLLEGE, Oxford, was founded in 1386 by William of Wykeham, bishop of Winchester and lord-chancellor of England, for a warden, seventy fellows and scholars, ten chaplains, three clerks, and sixteen choristers. By ordinances made in 1857, and amended in 1866 and 1871, the number of fellowships is fixed at thirty and the scholarships at forty. Fifteen of the fellowships are open only to candidates who have been educated at Winchester College for two years. Thirty of the scholarships are filled by an annual election, held at Winchester College, of six boys receiving education in the school of that college. Any scholarship for which there is no duly qualified candidate is thrown open for the time to general competition. All the fellowships and scholarships not above specified are open. All the scholarships are tenable for five years, and are at present £100 a year in value. By a statute passed in 1864 the choir is to consist of not less than three chaplains, eight lay clerks, and sixteen choristers.

NEWCOMEN, THOMAS, a mechanical inventor, distinguished for his successful efforts towards the improvement of the steam-engine. He was a locksmith at Dartmouth, in Devonshire, towards the close of the seventeenth century, and notwithstanding his humble situation he engaged in scientific researches, and carried on a correspondence with his celebrated contemporary, Dr. Robert Hooke, to whom he communicated his projects and inventions. Newcomen, having had his attention excited by the schemes and observations of the Marquis of Worcester, the French philosopher Papin, and by Captain Savery's proposal to employ the power of steam in draining the mines of Cornwall, conceived the idea of producing a vacuum below the piston of a steam-engine after it had been raised by the expansive force of the elastic vapour, which he effected by the injection of cold water to condense the vapour. The merit of first applying the steam-engine to practical purposes is thus due to Newcomen, who, in conjunction with Captain Savery and John Cowley, took out a patent for the invention in 1705. The important improvements effected by the celebrated James Watt were first suggested by a model of Newcomen's engine having been sent him for repair in 1763, when philosophical instrument maker to the University of Glasgow. See STEAM-ENGINE.

NEWEL, the central space or column round which the steps of a circular staircase are wound. When there is no central pillar the newel is said to be open.

NEW ENGLAND, a name commonly given to the north-east portion of the United States, comprising the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. The portion of the North American Continent lying between 40° and 48° N. lat., and extending from sea to sea, was granted by a charter of James I. in 1620 to the Plymouth Company under the title of New England. The name continues to be given as a popular designation to the above states, which still retain some peculiarities of character due to their original colonization by the English Puritans.

NEW FOREST, a large tract in England, in Hampshire, about 50 miles in circuit, which is commonly said to have contained many populous towns and villages, and thirty-six mother churches, till it was laid waste and turned into a forest by William the Conqueror. But it is impossible that such a tract could then have contained any number of towns or churches worth speaking of. King Henry VIII. built some castles in it, and it now contains several towns and villages. It is situated in that part of Hampshire which is bounded east by Southampton River, and south by the British Channel. Oak and beech are the principal trees, and the former have furnished a great deal of timber for the royal navy. This is the only forest which belongs to the crown of which the origin is known.

NEWFOUNDLAND, a large island of British North America, in the Atlantic Ocean, at the mouth of the Gulf of St. Lawrence, and nearer to Britain than any other part of America—the distance from the port of St. John to the harbour of Valentia, in Ireland, being only about 1918 miles. Its northern part is separated from the coast of Labrador by the Strait of Belle Isle, and its south-western extremity from Cape Breton and Nova Scotia by the great entrance into the gulf; lat. 46° 37′ to 51° 40′ N.; lon. 52° 40′ to 59° 31′ W.; greatest length, north to south,

350 miles; average breadth, 130 miles; area, 42,000 square miles. It is of extremely irregular form, with a coast-line, particularly on the south-east and south, broken up in a remarkable manner by broad and deep bays, harbours, coves, inlets, and lagoons. Many of these are extensive, commodious, and well sheltered, with numerous rivulets running into them; while most of the harbours have complete anchorages, with clear and good channels. The interior of the island appears to be rocky, with numerous tracts of moss, much intersected by rivers and lakes, and but thinly wooded except on the banks of the rivers. Great boulders or loose rocks, scattered over the country, increase the general roughness of its appearance. Hills and valleys continually succeed each other, the former never rising into mountains (the highest not exceeding 1500 feet), and the latter rarely expanding into plains. The sea-cliffs are for the most part bold and lofty, with deep water close to the shore. Rivers and lakes are numerous, and some of them of considerable size. The largest of the former are Humber River and the river Exploits, both issuing, like all the other streams in the island, from lakes or ponds in the interior, some of which are of great extent; the largest, called Grand Pond, being from 50 to 60 miles long and 5 miles broad; while the next in dimensions, Indian Lake, is 30 miles long and from 5 to 6 miles broad. The prevalent formation of the island is granite, and in some parts porphyry, quartz, gneiss, mica, and clay-slate, with secondary formations. The minerals of the island comprise coal, gypsum, copper, lead, nickel, silver, iron, and gold. Coal is found in two basins, the one near the south-western extremity of the island, the other in the interior to the north of Grand Pond. Copper also exists in large quantities, and the latter is worked to a greater extent every year. Already about one-sixth of the copper in the English market is exported from Newfoundland, and the amount is rapidly increasing, while that supplied from other sources is steadily decreasing. In 1877 the mining districts were connected with St. John's by telegraph. The climate, though severe, is healthful, the mortality among the inhabitants being lower than in most parts of the American continent, while in no other country is old age attended with greater bodily vigour and mental animation. Winter, which consists of a series of storms of wind, rain, and snow, lasts from the beginning of December until the middle of April. January and February are the coldest months. Snow does not lie long on the ground, and the frost is less intense than in West Canada, though the thermometer frequently falls 30° below the freezing-point. The summer is short and warm. In May and the beginning of June dense fogs prevail on the banks and neighbouring shores; but they do not appear to be in the least prejudicial to health. The principal trees are spruce, birch, larch, willow, and mountain-ash. Recumbent and trailing evergreens are met with in great variety, and the berry-bearing shrubs clothe every swamp and open tract. European and American grasses of various kinds abound, as also natural red and white clover and vetches. Agriculture employs a large portion of the inhabitants. The crops generally are abundant, particularly potatoes. Grain crops also thrive well, wheat having been known to yield 50 bushels per acre; but both climate and soil are perhaps fully more favourable to pasturage and green crops than to grain. The wild animals are the deer, bear, wolf, hare, beaver, marten, dog, wild cat, rat, and mouse. The pure breed of Newfoundland dogs, so much celebrated for their size, sagacity, and fidelity, is rarely to be met with, those generally seen in the island being crosses of every conceivable variety. Birds are numerous, both land and aquatic. On the coasts the morse or sea-horse formerly abounded, but has been nearly annihilated. Seals are numerous on the coasts, as are also whales, grampuses, and porpoises; and the famous banks of Newfoundland swarm with almost every variety of fish, particularly cod. These banks form the most extensive submarine elevation on the globe; in their full extent they occupy 16° of lon. and nearly 10° of lat., and are between 600 and 700 miles in length, with a depth of water varying from 4 to 160 fathoms, 40 being supposed the mean depth. The shores of Newfoundland, however, equally abound with cod as the banks, and are preferred by the English as fishing ground, being more convenient for curing and drying their fish, and less exposed to the fogs, rain, and sleet so frequent on the banks. The cod-fishery is prosecuted from June to November, and may be said to form the staple occupation of the inhabitants. The seal-fishery is next in importance to the cod-fishery. The exports from Newfoundland and the coast of Labrador (which, like Newfoundland, is not yet included in the Dominion) to Great Britain consist chiefly of fish and train-oil, and in 1882 amounted to £528,582; the imports of British produce amounted in the same year to £588,628. The principal articles of import were apparel and haberdashery, cotton, linen, and woollen goods, cordage and twine, iron (wrought and unwrought), hardwares, sugar, &c. Total exports to all parts in 1881, £1,551,072. The revenue amounted in 1881 to £229,035, the expenditure to £216,821; debt, £281,355.

There are a few Mic-Mac Indians in Newfoundland, but the aboriginal inhabitants are said to be extinct. A large proportion of the settlers are natives of Ireland, and of the islands of Guernsey and Jersey, and their descendants; but many of the inhabitants are also from other parts of the United Kingdom. The population has retained the habits of their old country to a greater degree than in other North American settlements.

The Roman Catholics, with 64,018 adherents, are the most numerous religious sect, the Church of England, with 59,057, next, and the Wesleyans third.

The affairs of the colony are administered by a governor, an executive council of six members, a legislative council of six members, and a legislative assembly of thirty-one representatives. The judicial department comprises a supreme court, with a chief and two assistant judges, a vice-admiralty court, and a district court. Education is denominational as concerns the Roman Catholics, non-denominational among the Protestants. There are four public academies in St. John's—one Roman Catholic, one Church of England, one Wesleyan, and one for other denominations. There are also Roman Catholic and Protestant colleges. Elementary schools have been established by the local legislature in every district in the island.

Newfoundland is supposed to have been discovered by the Norwegians, or Northmen, about the year 1000; but if so, it was re-discovered by John Cabot on the 24th June, 1497, when he took formal possession of the island, in which a settlement was subsequently formed by some Portuguese adventurers, who were in turn expelled by Sir Francis Drake in the reign of Elizabeth. After this period numerous English colonies were established from time to time along the east coast, and several French along the south, in the Bay of Placentia. But in 1713 Newfoundland and its dependencies were declared, by the Treaty of Utrecht, to belong wholly to Great Britain; the French reserving a right to fish and cure on certain parts of the coast. The only noteworthy town on the island is St. John's. Pop. 161,374.

NEW GRANADA. See COLOMBIA (UNITED STATES OF).

NEW GUINEA, or PAPUA, a large island in the Malay Archipelago, between 0° 15′ and 10° S. lat., and 131° 20′ and 151° E. lon.; area, 250,000 square miles; length about 1500, breadth from 200 to 400 miles. It is separated from Australia on the south by Torres Strait, and from the Moluccas on the west by Gilolo Passage. The coasts are for the most part lofty, with mountains coming close to the sea, but in the neighbourhood of Torres Strait the shore presents the appearance of a marshy flat, covered with dense forests. In the interior there are still loftier mountains, covered with perpetual snow, and volcanoes. In the south-east end Mount Owen Stanley rises to the height of 13,205 feet. There are but few quadrupeds, and these belong for the most part to the marsupials, including several species of kangaroos. New Guinea abounds in birds, among which are immense flocks of parrots and cockatoos, and the celebrated bird of paradise, large quantities of whose feathers are exported by the Malays on the west coast. The forests abound in enormous trees, including the camphor-tree; and bananas, cocoa-nuts, sago, sugar-canes, rice, maize, and yams are cultivated by the natives. On the west coast there are numerous Malay settlements, but the bulk of the inhabitants is composed of Papuas, a race resembling the negroes of Guinea. The discovery of New Guinea is sometimes attributed to Antonio Abreu, who is said to have made the discovery in 1511, but the first navigator who is known to have visited the island is another Portugese, Jorge de Meneses, who touched on it in 1526. Several surveys of parts of the coast were made by the Dutch from 1826 to 1835, and in 1828 the Dutch formally took possession of the island from its western extremity to lat. 134° E. From the year 1858 they have claimed as far as 140° 50′ E. The south-east coast was surveyed between 1845 and 1850 by Captain Owen Stanley of the British navy, and in 1873 Captain Moresby ascertained the exact form of the south-eastern extremity of the island, and discovered a passage by which the voyage between China and Australia is shortened by 300 miles. Since that date the island has received a good deal of attention from explorers having various objects. The naturalists were the first to make incursions into its interior, and among these Mr. A. R. Wallace, who visited it in 1858, was the pioneer. He was followed by the Dutchman Rosenberg, the Germans Meyer and Bernstein, and the Italians Beccari and D'Albertis, both of the last of whom have made repeated visits to it. The missionaries came next, and mission stations have been formed by Germans at Port Dore and Andai on the north-west coast, and by the London Missionary Society at various points on the south-east coast. Some of the missionaries, particularly Mr. Macfarlane, Mr. Octavius Stone, and Mr. Lawes, have shown themselves enterprising explorers. In 1875 the two former discovered a large river in the south called by the natives Mai Kassa (since called the Baxter River), navigable for ships of ordinary size for at least 60 miles up. At the end of the same year Mr. Macfarlane ascended along with D'Albertis about 150 miles up the Fly, another large river, which enters the Gulf of Papua on the west, and which D'Albertis has since ascended twice, in 1876 and 1877, reaching on the former occasion a distance of 500 miles up, which was as high as his vessel, a steam-launch furnished by the government of New South Wales, could be navigated. As the result of his explorations Signor D'Albertis does not hold out any great hopes with reference to the region traversed by the Fly. A more promising part of the island is the south-eastern peninsula, where there are mission stations at Hall Sound and Port Moresby on the coast opposite Queensland and elsewhere. There the mountains are clothed with forests which might prove valuable, the vast plains are rich in pasture-land, and the natives are said to be more intelligent and better disposed than in other parts of the island. On the 1st of June, 1877, an expedition sailed from Sydney under Mr. Powell, R.N., intending to proceed to the north-east of New Guinea, and carrying with them the requisites for forming a permanent settlement if such a thing were found desirable and practicable. Subsequently the announcement of the discovery of gold in the island was the cause of a number of exploring expeditions being fitted out in Australia; but gold was not actually found in sufficient quantity to make the search for it remunerative. In 1880 Mr. N. Chester, accompanied by the Rev. Mr. Chalmers, made a three months' cruise on the coast, including a journey inland. In 1880–81 the island acquired notoriety on account of the numerous murders of Europeans committed by the natives, and on two or three occasions the coasts were visited by British men of war for the purpose of punishing the islanders, which seems to have had a deterrent effect. The question of annexing the eastern portion of the island to the British Empire has again and again been mooted within the last few years. In 1883 it was formally annexed by Queensland, but this step has not received the sanction of the imperial government. Pop. estimated at 200,000.

NEW HAMPSHIRE, one of the United States of North America (capital, Concord), bounded on the north by Lower Canada, east by Maine, south-east by the Atlantic, south by Massachusetts, and west by Vermont, from which it is separated by the river Connecticut; area, 9305 square miles. This state has a sea-coast of only 18 miles. For the distance of 20 or 30 miles from the sea the land is almost level, but thereafter rises, and in its northern part is traversed south-west to north-east by a continuation of the Alleghanies, culminating in Mount Washington, 6285 feet high. The climate is subject to great extremes. The principal crops are wheat, Indian corn, oats, and barley; buckwheat, hay, hops, tobacco, potatoes, flax, beans, and pease are also raised. Apple and pear trees are abundant in the cultivated districts; and the hilly and mountainous regions are still covered with extensive forests of pine, oak, beech, birch, sugar-maple, &c. Of domestic animals, cattle, sheep, and pigs are numerous and large, but horses are both few and small. The wild animals include the bear, panther, lynx, wild cat, fox, wolf, mink, marten, racoon, and skunk in considerable numbers; more rarely the elk and moose. Reptiles are not numerous, and the rattlesnake is the only venomous serpent. The foreign commerce is inconsiderable and decreasing. Manufactures, however, are actively carried on, the principal being cotton, woollen, and worsted goods, boots and shoes, leather, lumber, iron (rolled and cast), machinery, furniture, &c. The length of railways open for traffic within the state at the end of 1882 was 1038 miles. The legislature consists of a Senate and House of Representatives, and the executive power is vested in a governor and a council of five members, all of whom are elected annually by the people. New Hampshire was first settled in 1623 at Dover and Portsmouth. It was for some time under the jurisdiction of Massachusetts, but since 1741 it has remained a separate state. The chief town is Concord, the principal port Portsmouth. Pop. (1870), 318,300; (1880), 346,991.

NEW HAVEN, a seaport town, United States, Connecticut, on a bay of same name in Long Island Sound, 72 miles north-east of New York. Among

the public buildings are an imposing state-house, and Yale College, with an extensive library and other valuable collections. The trade, both coasting and foreign, is extensive. Yale College is one of the oldest and largest of American colleges. It was commenced in 1700 as the collegiate school of the colony of Connecticut. It received a charter from the Colonial Assembly in 1701, which was extended in 1745, since which time it has not been materially altered. Its library was also, according to tradition, founded in 1700 by contributions of books made by ten ministers of the colony, who had incorporated themselves to erect and govern the college. The college continued at Saybrook till 1716, when it was removed to New Haven. The contributions of Governor Yale, begun about this time, finally caused his name to be attached to the college. The institution has gradually expanded until four faculties, in addition to the college proper or academic department, have been established. The medical school was founded in 1813, the theological faculty became a distinct department in 1822, about which time the law school was founded, and a scientific school, under the department of philosophy and arts, was organized in 1846. Yale College has had some liberal benefactors, among whom are James Fitch, Governor Yale, and Bishop Berkeley. The state has contributed at different times about £14,000, but the funds of the college have never been excessive. The library, which has a separate fund, numbers above 125,000 volumes. There is a separate library of about 20,000 volumes of general literature supported by the undergraduates. There is also a museum of natural history (zoology, geology, and mineralogy), established by a gift from Mr. Peabody of London, and named after him. Pop. (1870), 50,840; (1880), 62,882.

NEW HEBRIDES. See HEBRIDES (NEW).

NEW HOLLAND. See AUSTRALIA.

NEW JERSEY, one of the eastern United States, bounded on the north by New York, east by the Atlantic Ocean and the Hudson River, south by Delaware Bay, and west by the states of Delaware and Pennsylvania, from which it is separated by the Delaware River; area, 7815 square miles. The coast being low and shelving, has no harbours except for small vessels; but the bays of Newark, Raritan, and Delaware form excellent harbours for ships of the largest burden. The north-west part of this state is mountainous, being crossed by two ranges of the Appalachian chain. The chief minerals are iron, which abounds, especially the kind called bog-ore, and copper. In 1881 over 170,000 tons of pig-iron were produced. The working of the copper mines is no longer profitable. Lead ore is found in several localities, but not in sufficient quantities to pay for its working. Porcelain and potters'-clay of excellent quality are found and extensively used. Plumbago or graphite is mined with profit in two or three counties. The middle portion of the state is agreeably diversified by hills and valleys, but the southern part is level and sandy, and to a great extent barren, yielding naturally little else than shrub-oaks and yellow pine; but marl, which is plentiful, greatly improves its fertility. The other portions of the state have a good soil, and besides excellent pasturage, produce the usual cereals, with Indian corn (the staple), buckwheat, and potatoes. The fruits are good, especially apples, pears, cherries, plums, and peaches. The climate is mild, and nowhere is the cold severely felt in winter except in the mountainous regions of the north, where the finest cattle are reared, and large quantities of butter and cheese made. The Hudson and Delaware flow partly in this state. The principal manufactures are molasses and sugar, flour, iron and ironware, nails, cotton and silk fabrics, leather, shoes, hats, carriages, red and white lead, and some articles of brass and copper. In 1880 New Jersey ranked as the sixth in the value of its manufactured goods, which were valued that year at more than £5,000,000. Its principal export is agricultural produce. The state is intersected by several railways communicating with the lines of the northern, southern, and western states; at the end of 1882 the total length of railways open for traffic was 1870 miles. There are also two canals, uniting the rivers Hudson and Delaware, and the Raritan and Delaware. The state schools and educational establishments are supported by general and local taxes, the income of a permanent school fund, and by the sale and rental of certain riparian lands belonging to the state. The principal seat of learning and education is the college of New Jersey or Nassau Hall, in Princeton, one of the principal colleges in the United States. There is an excellent and prosperous state normal school at Trenton. The government of the state is vested in a governor, chosen for three years; a senate, likewise elected for three years; and a general assembly, chosen annually. The principal towns are Trenton, the capital; Newark, New Brunswick, Paterson, and Burlington. New Jersey was first settled by the Dutch from New York between 1614 and 1620. It adopted the constitution of the United States in 1787, being one of the thirteen original states of the Union. It is divided into twenty-one counties. Pop. in 1880, 1,131,116.

NEW LONDON, a city of the United States, in Connecticut, on the Thames, 3 miles from its entrance into Long Island Sound, 42 miles E.N.E. of New Haven. It is situated on a declivity, and is in general very irregularly built. The harbour, which is the best in the state, and one of the best in the Union, has a depth of 30 feet, and is safe and commodious. The foreign trade of New London is chiefly with the West Indies, and its coasting trade with the Southern States. The fisheries, and especially the seal and whale fishery, employ a great number of the inhabitants. Population in 1880, 10,537.

NEW MALTON. See MALTON.

NEWMARKET, a town in England, partly in Cambridgeshire and partly in Suffolk, 13 miles E.N.E. of Cambridge, 56 miles north-east of London, on the Eastern Counties Railway. It is chiefly celebrated for horse-races, being the first meeting in the kingdom. The town owes its support principally to the races, which are held chiefly in the spring and the months of July and October. It has one weekly market, held on Tuesday. Pop. (1881), 5447.

NEW MEXICO, one of the territories of the United States, bounded on the north by Colorado, east by Texas, South by Texas and Mexico, and west by the territory of Arizona; area, 122,580 square miles. The surface is generally mountainous, being traversed from north to south by the Rocky Mountains. It is drained chiefly by the Rio-Grande-del-Norte and its affluents. A small portion of the north-east belongs to the basin of the Mississippi. It consists chiefly of a central valley extending across the whole territory from north to south, with an average breadth of 20 miles, traversed by the Rio-Grande, and hemmed in either by the main chain or by ramifications of the Rocky Mountains, among which are the Sierra de los Mimbres on the west, and the Sierra Blanca on the east. To the south of the town of Santa Fé they average from 6000 to 8000 feet high, but in the vicinity of the town and north of it some snowy peaks are seen, rising to the height of 10,000 or 12,000 feet. They are composed chiefly of granite, syenite, basalt, &c., and are said to be highly metalliferous. The higher ranges are covered in many

places with pine forests, and the lower with cedars and occasional oaks. The climate, though differing widely in the mountainous districts and in the low valleys, is generally temperate, equable, and salubrious. In some of the more confined valleys, however, the summer heat often rises to 100°, and in the mountains the winter is both long and severe. The sky is almost always clear and dry. The soil is generally sandy, and looks poor; but when irrigation can be employed, produces abundant crops of Indian corn, wheat, and pulse. Fruits also are abundant, and the vine is largely and successfully cultivated. Considerable attention is paid to the rearing of cattle. New Mexico first became known to the Spaniards in 1581, and was taken possession of in 1598. It remained with them till 1848, when it was ceded to the United States. In 1850 it was erected into a territory of much greater area than at present. The territory of Arizona was cut off from it in 1863, and another portion of it transferred to Colorado in 1865. About nine-tenths of the white people are of Mexican origin. Pop. in 1880, 119,565.

NEW ORLEANS, a city and port of entry of the United States, in the state of Louisiana, county of Orleans, chiefly on the left bank of the Mississippi, 100 miles above its mouth, where by five outlets called passes it empties into the Gulf of Mexico. Its position, giving it the command of the traffic of one of the largest and most fertile river basins in the world, naturally marks it out as a great commercial emporium, but in several other respects subjects it to serious disadvantages. The alluvial flat on which it stands is a mere swamp, so low that it is never more than 9 feet above, and is usually several feet below the level of the river, from the inundations of which it is only saved by a strong levee or embankment, which has been built along the city front, and 200 miles above and 50 miles below, extending also around the city in the rear. The river immediately opposite has a width of ½ mile, and a depth of 100 to 160 feet; and sweeping round from the west, first in a north and then in a north-east direction, forms a large crescent-shaped curve. The original nucleus of the town is built around this bend, from which it derives its popular sobriquet 'the Crescent City.' The streets in this portion of the town are mostly narrow, but many of those in the suburbs are spacious and handsome, lined with shade-trees, which in a semi-tropical climate are both a luxury and a necessity. Tramways have been laid in all the principal thoroughfares, and on one of the tramway lines the cars are driven by fireless steam-engines, receivers charged with an ample supply of steam for a journey of six miles being put into the engines at starting. The public buildings are neither numerous nor very remarkable in point of architecture. The custom-house, built of Quincy granite, is said to be the largest edifice in the Union except the Capitol at Washington. Its basement is occupied by the post-office. The branch mint is also an important building. The State House was, prior to 1874, the famous St. Louis Hotel. The City Hall is a fine Ionic structure of white marble. New Orleans has about 150 churches, including a large and imposing Roman Catholic cathedral, and there are numerous school-houses, colleges, asylums, hospitals, market-houses, &c. Some of the hotels are built on a scale of great magnificence. The cemeteries, too, both from their extent and peculiarity of structure, must not be left unnoticed. Owing to the swampy soil, burial underground is never attempted, except in the Potter's Field, appropriated as the final resting-place of poor and friendless strangers. The Protestant and Roman Catholic cemeteries consist of vaults, with arched cavities, in which the bodies are arranged above each other, tier upon tier, to the height of 12 feet. The ground inclosed is divided into plots, intersected by gravel walks, and densely covered with tombs. The manufacturing establishments of New Orleans are of limited extent, and may be summed up under the heads of foundries, machine-shops, distilleries, sugar-refineries, saw-mills, and tobacco factories. The city is the great cotton market of the Union, most of the cotton of Arkansas, Tennessee, Alabama, Texas, and Mississippi being shipped here. Its exports at present exceed £20,000,000 a year, chiefly in cotton. It is also the centre of a large and increasing sugar industry, both banks of the river for miles above and below the city being lined with immense sugar plantations. Grain and tobacco are also extensively exported. New Orleans is rapidly recovering from the depression consequent upon the late civil war, and seems to have some prospect of a brilliant future. The chief obstacles to its prosperity were, until recently, the ravages of yellow fever during the summer months, causing an almost complete interruption of business; the want of an adequate system of railways, and the bars at the mouth of the river, which since 1722 had diminished the depth of water from 25 to 12 feet. The first and most formidable of these obstacles has been greatly removed by the adoption of sanitary measures on a grand scale, including a peculiar system of drainage rendered necessary by the low and swampy site of the city. By means of a system of street canals and powerful steam-pumps the refuse water and sewage is raised and emptied into Lake Pontchatrain in the rear of the city. Large iron pumps laid along the river front keep a constant flow of water passing through the street canals and gutters. The second obstacle no longer exists, as five great railway systems now connect New Orleans with all the principal cities of the Union. The third obstacle has been overcome by the construction of a system of jetties at South Pass, which has enabled the river to scour for itself a passage with a depth of 30 feet on the bar, thus permitting ships of the largest draught to reach the city docks. Regular lines of steamers between Britain, France, and Spain have now established communication here.

New Orleans was founded by the French in 1717, and named after Philip, Duke of Orleans, then regent of France. It was shortly after abandoned; but having been again settled in 1722, began to prosper, and became the seat of government of Louisiana. By treaty in 1763 it was ceded to Spain, along with all Louisiana west of the Mississippi, and continued to make good progress. In 1769 occurred the first outbreak of yellow fever, introduced, it is said, by an English vessel having a cargo of slaves from Africa. In 1801 Bonaparte, among the other concessions extorted from Spain, insisted on that of Louisiana; but had no sooner obtained it than he was satisfied that he could not retain the possession, and endeavoured to make the most of the acquisition by selling it to the United States. At this time (1803) its population was 8000. In 1804 it was made a port of entry, and in 1805 was incorporated. In 1815 an attempt upon it by the British under General Pakenham was defeated by General Jackson. In January, 1861, Louisiana joined the Confederate States in their secession from the Union, and on 28th April, 1862, New Orleans surrendered to the Federal forces under Admiral Farragut. It has at several periods been formally recognized as the political capital of the state, but was finally deprived of that honour in 1880; Baton Rouge now holding that position. Pop. in 1870, 191,418; in 1880, 216,290.

NEW PLATONISTS, a philosophical sect, so called because they founded their speculations on those of Plato. The sect of Platonists (see PLATO) was, of all the sects belonging to the Socratic school, the most numerous; but their zeal relaxed, whilst others, particularly the sceptics, began to excite greater interest. In the third century of the Christian era, however, the Platonists rose anew, and formed a distinct sect—that of New Platonists, also called the *Alexandrian Platonists*, because their chief seat was at first in Alexandria. Their doctrines had a tendency to unite Platonism with Orientalism, to blend Platonic ideas with Oriental mysticism. The fresh impulse which the Platonic philosophy in a new form suddenly received, is to be explained by the peculiar genius of the first new Platonists; their opposition to scepticism; the inclination of the Greeks, enervated by luxury, to mysticism and oriental fanaticism; and a subsequently formed desire to oppose to the victorious progress of Christianity a philosophical system of paganism, for they did not at first set out as the avowed enemies of Christianity. The New Platonists aimed at the highest knowledge—the knowledge of the *absolute*, and an intimate union with it, in order to fulfil the destiny of man, to attain a perfect acquaintance with the universe, holiness, and happiness, to which, as they maintained, the knowledge of the *absolute* would alone lead. Ammonius Saccas of Alexandria (a man of extraordinary genius, who was obliged to earn his bread by carrying loads, and who, according to the common opinion, was the founder of this school) inspired his pupils, among whom were the famous critic Longinus, Plotinus, Origen, and Herennius, with his own poetico-philosophical zeal. Plotinus (born at Lycopolis, in Egypt, A.D. 205, and died 270) contributed chiefly to settle the doctrines of New Platonism in his writings. Philosophy, according to him, should know the One which is the cause and essence of all things, the original or primitive light from which everything emanates, not by thought and reflection, but in a perfect manner by intuition, which precedes thought. The philosophy of Plotinus, therefore, rests upon the proposition that the absolute, that which is above the senses, is the foundation of the world; and that it is knowable by intuition, which precedes thought. Intelligence, the product and image of the One, penetrates all things; and the soul proceeds from it, as the forming thought; the soul again seeks the One, the Good, the original cause of the universe. This is done by immediate intuition and enjoyment; and thus, according to him, the conceiving and the conceiver become one; the conceiving soul becomes what it conceives; it returns to the One. The whole spiritual world is therefore to be considered as one spiritual being. All is only an intuition. The sensible world is but the image of the intelligible world; time is an image of eternity, and emanates from it. Evil is either only apparent or necessary; but if necessary, it ceases to be evil. The god of Plotinus is a mystical Trinity, consisting of three Hypostases or Substances, having for its basis unity, which is the universal principle, from which emanates pure intelligence, and from this, in turn, the soul of the world. Among the pupils of Plotinus, Porphyry (Malchus) and Amelius are distinguished. Iamblichus, a pupil of Porphyry, who first strongly manifested a distinctively anti-Christian tendency, had a large number of disciples, among whom Eustathius, Ædesius, and the Emperor Julian, were the most celebrated. At a later period Athens became the seat of New Platonism. Among the later New Platonists Proclus of Constantinople (from 412 to 485) is distinguished. He was a man of extraordinary learning, and in him culminated the hostile tendency of the Neo-Platonic philosophy to Christianity. Two circumstances chiefly render the New Platonists interesting: first, that poetical elevation of the soul which is most welcome when the student has passed through all the dogmatic systems and scepticism, without finding satisfaction; and, secondly, the reconciliation which their system attempts between the Greek philosophy on one side, and the most ancient symbolical system of the East, paganism in general, on the other. Hence, also, the union of Platonism and the Pythagorean philosophy, and the desire of uniting the contending views of former sects. This attempt, however, to conceive the popular religion, or paganism in its original sense, has led some to reject those accounts which they cite to prove their opinions; and it has been asserted that they themselves living at so late a period, cannot be testimonies to facts partly buried in the obscurity of remote history. But, on the other hand, it has been asserted that many of these antiquarian and mythological notices which we find first or only with the New Platonists, bear too much the stamp of truth to be considered as invented by them, and that they might have been taken from earlier sources. The scholastic philosophy and dialectic subtlety of the middle ages, which were addressed solely to the understanding, and the want of a philosophy which should satisfy the whole nature of man, caused, towards the end of the fifteenth century, the renewal of Platonism, as modified by the New Platonists. The most distinguished supporter of this new Italian Platonic philosophy, patronized by the Medici in Florence, was Marsilio Ficino, who died in 1499.

NEW PLYMOUTH, a town of New Zealand, in the North Island, capital of the province of Taranaki, beautifully situated on the west coast, 120 miles from Auckland. It has government offices, custom-house, town-house, Episcopalian, Presbyterian, Wesleyan and Primitive Methodist, Roman Catholic, and Baptist churches, an hospital, a jail, a tannery, breweries, and flour-mills. Pop. (1881), 3310.

NEWPORT, a municipal and parliamentary borough in the Isle of Wight, on a gentle ascent, on the left bank of the Medina, which is navigable to the town for small craft. It is a clean, well-built town, has a handsome town-hall, comprising public offices, and an excellent market-place beneath; a small theatre, jail, and house of correction; the church of St. Thomas of Canterbury, containing a monument to the Princess Elizabeth, daughter of Charles I., erected by Queen Victoria; other two churches, a Roman Catholic and Dissenting chapels. There is some trade in malt, corn, timber, &c., but the principal business of the place consists in supplying the wants of its numerous visitors. About 1 mile south-west from the town are the ruins of Carisbrooke Castle. The borough sends one member to Parliament. Pop. of mun. bor. in 1880, 9357; of parl. bor. 9144.

NEWPORT, a seaport, municipal and parliamentary borough, in the county and 20 miles south-west of the town of Monmouth, on both banks of the Usk, here crossed by an elegant stone bridge about 5 miles from its mouth in the estuary of the Severn, and on the South Wales and Monmouthshire sections of the Great Western Railway. It is irregularly built, except in the more modern parts, which are elegant; and has a large and ancient parochial, and three other churches, and numerous places of worship for Baptists, Independents, Wesleyans, and Roman Catholics; a good haven, and a considerable trade. Chief exports, iron, coal, and tin-plate; imports, iron-ore, provisions, timber from America and the Baltic, and general goods. The docks are spacious, and capable of admitting vessels of any dimensions and

burden at all states of the tides. Shipbuilding is carried on to some extent. There are also here several iron-foundries, an extensive nail-factory, several sail-lofts, and large anchor and chain-cable manufactories, &c. It unites with Monmouth and Usk in sending a member to Parliament. Pop. of mun. bor. in 1871, 27,069; in 1881, 35,313.

NEWPORT, a flourishing city of Campbell county, Kentucky, on the river Ohio, opposite Cincinnati, and 80 miles N.N.E. of Frankfort. It owes its rapid growth and importance to its proximity to Cincinnati, and to the beauty of its situation. It contains several extensive rolling-mills, iron-foundries, steam-mills, and a silk manufactory. Pop. 20,433.

NEWPORT, a seaport town, United States, one of the capitals of Rhode Island, finely situated on its south-west shore, at the main entrance of Narragansett Bay, 26 miles south by east of Providence. It is defended by a large and strong granite fort; and has twelve churches, a synagogue, state-house, city-hall, custom-house, market-house, athenæum, and library. The manufacturing establishments consist of a few cotton-mills, soap and candle works, a shot-tower, and lead-works. Its facilities for trade are great, as it has one of the largest, safest, and most accessible harbours in the Union, but its chief importance depends on its attractions as a fashionable watering-place. Pop. in 1880, 15,693.

NEWPORT-PAGNELL, a market town and parish, county of Buckingham, on the Ouse, 48 miles N.N.W. of London. It has a noble-looking church, several other places of worship, several schools, a few alms-houses, a circulating library, savings-bank, and a society for promoting Christian knowledge. Pop. 3686.

NEW PROVIDENCE. See PROVIDENCE.

NEW RED SANDSTONE, the lowest group of secondary rocks, lying between the Permian below and the Lias above. See GEOLOGY.

NEW ROSS, a river port and parliamentary borough of Ireland, on the Barrow, 2 miles below its juncture with the Nore, situated partly in Kilkenny but principally in Wexford county, 84 miles S.S.W. of Dublin. There is an iron bridge over the river, movable by a swivel pillar in the centre. The town is old, and about the middle of the thirteenth century was surrounded by walls. There is considerable commerce, but there are almost no manufactures. The port can be entered at all states of the tide by vessels of 600 tons, and at spring-tides by ships of 800 tons. It has canal communication with Dublin. Quarter-sessions are held here, and it is also a barrack station. It returns one member to Parliament. Pop. in 1871, 6772; in 1881, 6670.

NEWRY, a town, Ireland, finely situated near the mouth of the Newry, in Carlingford Bay, and on the Dublin and Belfast Junction Railway, 32 miles S.S.W. of Belfast. It consists of a handsome square and several well-formed streets, and has several churches and chapels, one of them conspicuous by its lofty spire; a handsome court-house, nunnery, &c. The chief industrial establishment is an extensive iron and brass foundry, but there are several corn and flour mills, tan-yards, and large spinning mills. An excellent harbour affords facilities for a considerable trade. Newry returns a member to Parliament. Pop. in 1871, 14,158; in 1881, 15,590.

NEW SIBERIA, a group of islands in the Arctic Ocean, off the north coast of Siberia, in the government of Yakutsk, to which they belong. The area is estimated at 20,480 square miles. The group comprises Kotlinoi, Fadievskoi, New Siberia, Liakhov, and several smaller islands. New Siberia, which gives name to the group, is the most easterly of the islands, and is 75 miles long by 30 miles broad. Hedenstroem discovered it in 1809. The islands produce neither bush nor tree, and it is therefore not surprising that there should be no inhabitants. They are commercially important, as the soil contains much fossil wealth in the shape of the bones and teeth of the mammoth, rhinoceros, and buffalo.

NEW SOUTH WALES, a colony of Great Britain, which at one time comprised the eastern half of Australia. It is now separated from Queensland on the north by an irregular line running south-west from Port Danger (lat. 28° 8′ S.) till it meets the 29th parallel of latitude, which forms the rest of the north boundary; it is bounded on the west by the 141st meridian; on the south by the Murray, and a line running north-west from Cape Howe (lat. 37°31′); on the east by the Pacific. Its area is 323,437 square miles. The surface is much diversified, and presents, in its general features, a succession of hills and valleys, mountains and plains. A mountain range (the Great Dividing Chain), varying in height from 3000 to 6000 feet, extends from north to south nearly parallel to the coast, at the distance of from 30 to 50 miles inland, and takes in the north the name of Liverpool Range, in the centre that of the Blue Mountains, and in the south that of the Australian Alps. The highest summit is Mount Kosciusko, in the south-east, 7308 feet. The intervening space between the mountains and the sea is partly broken by spurs and ramifications, but descends from the west with more or less rapidity, and has a generally undulating surface, intersected by water-courses; in some places well wooded, and in others covered with dense brushwood.

The coast-line presents in general bold perpendicular cliffs of sandstone, in horizontal strata. Occasionally the cliffs are interrupted by low sandy beaches, some of which stretch to a considerable distance inland, and appear to have been covered by the sea at no very remote period. The indentations of the coast are more remarkable for their number, and the excellent harbours which they form, than for the space which they occupy. Among them may be mentioned Port Stephens, Port Hunter, Broken Bay, Port Jackson (on which lies Sydney), Botany Bay, Jervis Bay, Sussex Haven, and Twofold Bay. The mountain range which has been already described forms the great watershed of the colony; but the ground on the west, instead of descending rapidly, continues rugged and mountainous for a considerable width, and at last assumes the form of an elevated plateau. The most important rivers of the colony are the Murray, which, as already mentioned, forms a large portion of the southern boundary, and is navigable as far as Albury (lon. 147° E.); the Murrumbidgee and Lachlan, farther north, which fall into the Murray after uniting together; and the Darling, which flows from north-east to south-west through the whole extent of the colony, and also falls into the Murray. The chief affluents of the Darling are the Bogan, the Macquarie, the Castlereagh, the Naomi, and the Warrego. The Murrumbidgee is 1350 miles long, the Darling 1160, the Macquarie 750, the Lachlan 700. Notwithstanding the existence of those large rivers the western plains of the colony are but sparely watered. The comparatively narrow space intervening between the mountains and the Pacific leaves little room for the development of large rivers. Many of them are for a great part of the year either altogether dry, or form, in fact, rather a succession of deep ponds or water-holes than continuous streams. The most deserving of notice for their length or their locality are the Hunter, 300 miles, which falls into the fine port of that name at Newcastle, and is navigable for 50 miles above its mouth by small craft of 30 to 40 tons; and

the Hawkesbury, 330 miles, which falls into Broken Bay, and is navigable by vessels of 100 tons as far as Windsor, a distance of 140 miles. These rivers in the winter season frequently cause disastrous floods.

Geology and Minerals.—As a general rule the prevailing rock on the east side of the mountains is sandstone, and on the west granite. Above the granite, quartz and syenite are seen forcing their way to the surface, and overtopping them; greenstone and porphyry often form lofty summits. Notwithstanding the numerous indications of tremendous volcanic agency in almost every mountain district, no active volcano is known to exist in New South Wales, unless we are to give the name to the very extraordinary phenomena exhibited by Mount Wingen, situated near the sources of Hunter's River. It consists of a mass of sandstone from 1400 to 1500 feet high, and since 1818, when it was first discovered, and probably from a much earlier period, has been in a state of active ignition, kept up by the spontaneous combustion of some unascertained magazine of fuel within. In connection with the granite, limestone, both granular and foliated, occurs in abundance, and besides being often hollowed out into stalactitic caverns, sometimes passes into a beautiful close-grained marble, as white as that of Carrara. In some places it becomes of a jet-black colour, traversed by white veins, and at others becomes finely variegated. Much of the sandstone belongs to the carboniferous system, and is accompanied with workable seams of excellent coal. One field, to which the name of Newcastle has been appropriately given, is said to vie in quality with that of the English Newcastle, and contains no fewer than sixteen seams, that worked at present being from 8 to 10 feet in thickness. The total output of coal in 1881 amounted to 1,775,224 tons, of the value of £603,248; 4098 pitmen and others were employed in raising it. Copper ore of the richest quality has been found in such abundance that the veins are believed to extend in every direction over many miles of the Wellington districts. During 1881, 5493 tons were raised. Tin exists in large quantities, and iron is very generally distributed. Silver and lead have also been found. All these minerals, however, though valuable, have been thrown into the shade by the discovery, in the year 1851, of auriferous deposits, which, from the great number of places in which gold has already been discovered, indicate its existence over the whole colony. The commissioner of the southern gold-fields, writing in January, 1873, expresses his belief that there are areas of many thousands of square miles in extent yet untouched that are as likely to contain hidden treasures as any of the most productive of the gold-fields. Up to December 31, 1881, the total yield of gold in New South Wales, exclusive of what is believed to have passed out of the colony in private hands, is stated at 9,225,179 oz., of the value of £34,343,857. The value of the gold produced in 1881 was estimated at £556,513.

Climate.—The position of New South Wales makes its seasons the very reverse of those of Britain, the month of January being its midsummer, and that of July its dead of winter. As the area of the colony extends over eleven degrees of latitude, and as it contains a good deal of elevated ground, nearly every variety of temperature is to be found, from the hottest to the coldest, short of the arctic. The air in general is remarkably elastic and salubrious, and instances of great longevity are not uncommon. Epidemic diseases, with the exception of ophthalmia, are scarcely known. When rain falls it descends in almost continuous torrents, and while the annual fall is only 22·19 inches at London it exceeds 52 inches at Port Jackson, and 62 inches at Port Macquarie. The prevailing winds at Sydney in 1881 were west, north-east, and south. The thermometer in the shade showed the mean temperature to range from 44° to 76°; the highest was 100° in February and the lowest 39° in June. Snow does not lie in the valleys, but in winter the loftiest of the hills are covered, some of the mountains reaching the line of perpetual snow. In the inland plains during the greater part of the summer the thermometer is usually over 100° in the shade, and sometimes reaches 140°.

Agriculture, Manufactures, and Commerce.—For the peculiar productions of the vegetable and animal kingdom see AUSTRALIA. The absence of water renders much of the land useless for agricultural purposes, but a large proportion of this is employed for the feeding of stock. There is no great breadth of land suitable for the formation of plants, from its being rich in decayed vegetable matter, away from the river banks; but the fertility of the land on the margins of rivers, particularly the bottom lands of the Clarence, Macleay, Manning, Hunter, Hawkesbury, and Shoalhaven, is not exceeded in any part of the world. However, being liable to inundation, the year's harvest may be swept away in a few hours. In 1881–82, 221,888 acres of land were under wheat, 117,478 under maize, 16,348 under oats, and 15,944 under potatoes. The produce was: of wheat, 3,405,966; of maize, 4,930,956; of oats, 356,566 bushels; and of potatoes, 44,323 tons. The fruits of native growth are neither numerous nor valuable, but the best of those of Europe have long been acclimatized, and are everywhere seen in abundance. So well does the peach thrive that farmers sometimes feed their pigs with the windfalls of their orchards; and even the fatigue and thirst of the traveller through the forest has often been relieved by the produce of peach-trees grown from stones probably dropped by birds. In the more southern parts of the colony the fruits include apples, pears, peaches, apricots, nectarines, cherries, plums, oranges, figs, grapes, melons, mulberries, gooseberries, currants, &c., and in the more northern parts the banana is equally abundant. Some of these fruits are evidently capable of being turned to good account, and accordingly the rearing of silkworms on the mulberry, which might be carried to an almost indefinite extent, has attracted attention. The vine is also successfully cultivated, as well as the sugar-cane; and some tobacco is grown. The rearing of sheep and cattle are the chief employments of the people, and wool is the most important article of export. The annual value of this export is not without fluctuations, but on the whole it is rapidly increasing. In 1882 the quantity exported both by sea and through other colonies (for shipment) was of the value of £7,500,000. The rapid growth of the general commerce of this colony is shown by the following statement of the total imports and exports by sea and land in the years noted:—

	1855.	1870.	1882.
Imports,	£4,668,519	£7,757,281	£21,284,130
Exports,	2,884,130	7,990,038	16,716,961

The principal imports are wearing apparel, sugar, tea, and hardware. The manufacturing industries of the colony are naturally not of much importance as yet, but there are tanneries, breweries, woollen factories, soap and candle works, steam saw-mills, ship-building yards, foundries, &c. In 1882 there were 1175 miles of railway open, while about 500 miles more were in course of construction; the telegraphic wires extended over 14,278 miles.

Government.—In 1850 Port Philip, which formerly depended on New South Wales, was erected into a separate colony under the name of Victoria, and in-

dependent legislatures established in both. At present the constitution of New South Wales vests the legislative power in a parliament of two houses, the Legislative Council namely, and the Legislative Assembly. The former consists of not fewer than twenty-one members nominated by the crown, originally for the term of five years, but, subject to certain conditions, for life at the expiration of that period; and the latter of a hundred and eight members chosen by seventy-two constituencies. To be eligible for the Assembly a man must be a natural-born British subject, or if an alien, have been naturalized for five years, and resident two years before election. The voting qualification is the same, and voting is by ballot. As electors require no property qualification there is virtually universal suffrage. The executive consists of a governor nominated by the crown, assisted by a council composed of colonial secretary, colonial treasurer, the ministers for lands and public works, attorney-general, and solicitor-general. The parliaments last for five years. Unless local acts supersede them the imperial laws are enforced in the colony. No enactment of the colonial legislature becomes law till sanctioned by the queen.

People, Religion, Education, &c.—The colony of New South Wales owes its origin, and in a great measure its early prosperity, to the convicts sent from the mother country to expiate their crimes in compulsory toil. It was some years before free settlers began to arrive, the first settlers being convicts who had served out the period of their punishment, or who had been discharged on account of their good behaviour, though lands were assigned also to such of the soldiers as were content to remain in the country on the expiry of their term of service. The works on which the convicts were chiefly employed in the early period of the colony's existence were road-making and preparing the soil for agriculture. This and the discovery of the suitability of New South Wales for sheep-breeding led to the arrival of free colonists. To these convicts were assigned as shepherds and domestic servants, and though this system was a recommendation of the colony as a field for emigration, there can be little doubt that the morals of youthful members of respectable families must have suffered from the contact with criminals. There was naturally a great deal of vice and lawlessness among the population for a long period, for it was not to be expected that released felons or their children could form very exemplary members of society, though many of them acquired wealth and a good position in the colony. Since 1840, when convicts ceased to be sent to Sydney from the mother country, the convict taint may be said to have disappeared from the population, but even though the system had continued, the great increase in the respectable portion of the settlers would have greatly lessened the influence of the convict element. In 1836 the convict population formed nearly a third of the whole, though the total population then was 76,796. During the whole period in which felons were transported to the colony the total number sent was 54,583. In 1851 the population amounted to 106,229 males and 81,014 females, or a total of 187,243. It has since gone on increasing with rapidity, and in the census year 1881 it had reached 751,468, composed of 411,149 males and 340,319 females. There is no established religion in New South Wales. Among the religious sects the Church of England, the Roman Catholics, the Wesleyan Methodists, and the Presbyterians hold the chief place. The educational system comprises the primary schools, the grammar-school, St. Paul's and St. John's College, and the University of Sydney. The primary schools are scattered all over the country. The grammar-school was founded and endowed by the state, and is intended partly to prepare pupils for the university. The number of public and private schools in 1882 was 2066, with 3772 teachers, and 197,412 scholars, an increase in the attendence of 27,980 on the previous year.

History.—In 1770 Captain Cook, after sailing round the east coast of Australia, landed on a low swampy creek, to which, from the number of plants found in it, he gave the name of Botany Bay; while to the whole coast along which he had sailed he gave the name of New South Wales, from a fancied resemblance in its physical features to that part of South Britain. The name thus given continued to be applied vaguely, but has now been accurately defined by recent acts. In 1788 Captain Arthur Philip, the first governor, arrived and cast anchor in Botany Bay, having with him 775 convicts. The colony at first suffered much from scarcity of provisions, and afterwards more from mismanagement, more especially from the tyrannical conduct of Governor Bligh, appointed in 1806, who proved himself still more unfit for his new office than for the command of the *Bounty;* and at last so exasperated the colonists that in 1808 they rose *en masse,* deposed him from his office, and placed him under arrest. He was fortunately succeeded by Governor Macquarie, a man of a very different stamp, during whose active and enlightened administration of twelve years the colony made rapid progress. The most important events in its history since are the termination of the introduction of convicts in 1840; the establishment of representative institutions in 1843; the erection of Victoria into a separate colony, and an improved legislative act for both colonies, in 1850; the important discovery in May, 1851, of extensive auriferous tracts, by which a new era in the history of the colony commenced, and both its wealth and population have been vastly increased; and the establishment of direct steam communication with Great Britain in 1852. Since that time the prosperity of the colony has advanced with great rapidity, and with its roads and railways, and a constantly increasing population, there is no doubt a great future before it.

NEWSPAPERS. One of the most remarkable phenomena of modern times is the periodical press, vitally affecting society in all its relations, and forming one of the political elements of modern free nations which the ancients had not even in embryo. So influential is it as a political force that it is often called the fourth estate of the realm. Among the Romans the Acta Senatus, containing an account of the various matters brought before the senate, the opinions of the chief speakers, and the decision of the house, published regularly every day by command of Julius Cæsar, as part of the government gazette, form the earliest approach to the modern newspaper. The Acta Diurna, called also Acta Publica, were a still nearer approach. During the later times of the republic, and under the empire, they were published daily at Rome by the authority of the government. They contained a register of the births and deaths in the city; an account of the money paid into the treasury from the provinces, and everything relating to the supply of corn; extracts from the Acta Forensia and from the Acta Senatus; and a kind of court circular, containing an account of the births, deaths, festivals, and movements of the imperial family. Such details of public affairs and foreign wars as it was deemed expedient to publish were also included in them, as well as accounts of prodigies and miracles, the erection of public buildings, fires, funerals, sacrifices, a list of the various games, &c. The speeches in the senate and the public assemblies were taken down by short-hand writers called *actuarii.* These, as-

sisted by clerks and notaries, drew up the Acta, under the superintendence of censors, quæstors, and other magistrates. The publication consisted in posting them in some public place, that any one who pleased might read them. They ceased to be published after the downfall of the Western Empire.

The origin of newspapers is to be referred to Germany and Italy. In the latter half of the fifteenth century, immediately after the invention of printing, small sheets, usually in the epistolary form, appeared in Augsburg, Vienna, Ratisbon, and Nürnberg. They were called Relationen and the Newe Zeytung, and the numbers extant furnish accounts of the discovery of America and of other important public events, and like modern newspapers they chronicle the more interesting and startling local incidents. The war which the Republic of Venice waged against Solyman II. in Dalmatia gave rise in 1563 to the custom in Venice of communicating the military and commercial information received by written sheets (*notizie scritte*), to be read at a particular place by those desirous to learn the news, who paid for this privilege in a coin not any longer in use, called *gazzetta*—a name which by degrees was transferred to the newspaper itself in Italy and France, and passed over into England. A file of these Venetian papers for sixty years is still preserved in the Magliabecchi Library at Florence. The first regular paper was a monthly (written) government paper at Venice; and Chalmers, in his Life of Ruddiman, informs us that 'a jealous government did not allow a *printed* newspaper; and the Venetian Gazetta continued long after the invention of printing, to the close of the sixteenth century, and even to our own days, to be distributed in *manuscript*.'

It has been commonly supposed that the first English newspaper made its appearance in the reign of Queen Elizabeth, and that its publication took place in order to convey to the people the tidings of the approaching armada from Spain, and the various counter-movements on the part of the British army and fleet. One of these sheets, bearing the title of the 'English Mercurie, published by authoritie, for the contradiction of false reports,' is preserved in the British Museum, but it has been satisfactorily proved to be a forgery of the eighteenth century by the date of the paper on which it is printed, the modern handwriting of the printer's manuscripts (still preserved), and the numberless misstatements and anachronisms which it contains. No genuine newspaper of the sixteenth century, unless we except some pamphlets published under the titles of Newes from Spaine, &c., has been preserved, and it is not till 1622 that we find 'The Weekly News from Italy, Germany, &c.,' published by Nathaniel Butter, Nicholas Bourne, and Thomas Archer, and which may be regarded as the first specimen of the regular newspaper which appeared in England. Other journals followed, but it was not till the breaking out of the parliamentary wars that the newspaper first assumed that political influence which in later times has enabled it to hold so important a position as a leader of public opinion. One of these, published in November, 1641, under the title of Diurnal Occurrences, or the Heads of several Proceedings in both Houses of Parliament, is noticeable as the first which furnished a report of the proceedings in Parliament. The other papers which followed this in rapid order, bore the names of the English Post, England's Memorable Accidents, The Kingdom's Weekly Intelligencer, The Spy, The Parliament's Scout, The London Post, The Country Messenger, &c., and were most of them published weekly. In Cromwell's time the principal journals were the Mercurius Politicus and the Public Intelligencer, which were published on different days of the week; and after passing through various changes of name were ultimately incorporated into the London Gazette, the first number of which was issued on the 7th of November, 1665, at Oxford, whither the court had retired in consequence of the plague then raging in London. It has since been uninterruptedly published twice a week for more than two centuries. A considerable number of newspapers sprang up in consequence of the ferment occasioned by the 'Popish Plot,' and the bill for excluding the Duke of York from the throne; and with the view of suppressing these a royal 'Proclamation for Suppressing the Printing and Publishing Unlicensed News-books and Pamphlets of News' was issued on 12th May, 1680. It produced but little effect, however, as the want of English newspapers was supplied by a continual importation of journals from Holland, the extensive circulation of which acted as useful pioneers in preparing the way for the Revolution. On this latter event taking place many new journals arose, such as the Universal Intelligence, the English Courant, the London Courant (these three made their appearance on the day following the abdication of James II.), the London Mercury, the Orange Gazette, the Harlem Courant, and others. A curious instance of the dearth of news often experienced by the newspaper writers of that time is to be found in the Flying Post in 1695, which announces that 'if any gentleman has a mind to oblige his country friend or correspondent with this account of public affairs, he may have it for twopence, of J. Salisbury, at the Rising Sun in Cornhill, on a sheet of fine paper, half of which being blank he may thereon write his own private business or the material news of the day.' Again, we find in Dyer's News-letter: 'This Letter will be done upon good writing paper, and blank space left, that any gentleman may write his own private business. It will be useful to improve the younger sort in writing a curious hand.' Another expedient for supplying the want of news was by filling up the paper with extracts from Scripture.

The first London daily paper was published in 1709 under the name of the Daily Courant. About the same period appeared Defoe's celebrated journal, the Review. The first number of the Tatler was published on 23d April, 1709, and of the Spectator on 1st March, 1711. Though not properly newspapers in the modern sense of the term, these were then classed under the same category, and in point of fact their early numbers contained general news in addition to their other literary matter. In 1712 a tax or stamp-duty was imposed by government of a halfpenny on papers of half a sheet or less, and a penny on papers of a single and above half a sheet. The Spectator had previously to this been sold at a penny, but on the imposition of the halfpenny tax its price rose to twopence, a circumstance which is generally said to have caused the stoppage of that celebrated periodical in 1713.

Among the journals of the last century may be noticed more especially the Public Advertiser, which first appeared in 1726 under the title of the London Daily Advertiser, and became afterwards so celebrated by the publication in it of the famous Letters of Junius. The Morning Chronicle appeared in 1769, and the Morning Post in 1772. The Times was first commenced on 18th January, 1785, under the name of the London Daily Universal Register, which was afterwards superseded by that of the Times on 1st January, 1788. It was ably conducted from the first by Mr. Walter, who in 1803 transferred the management of it to his son, under whose conduct the paper gradually rose to that exalted position in the ranks of journalism which it has since retained.

To the ingenuity and energy of the younger Mr. Walter is due the invention of printing by steam, and the first copy of the Times so printed appeared on 29th November, 1814.

From the date of the establishment of the Times scarcely any attempt to start a daily paper in London for a long time succeeded, with the exception of the Morning Advertiser and the Daily News; which last, however, had to maintain a severe struggle before successfully establishing itself. At present it is said that the circulation of the Daily Telegraph exceeds that of the Times, while other daily journals, such as the Standard, Echo, &c., are largely circulated. The most noted events in the recent history of the newspaper press are the reduction of the stamp duty, which had been gradually raised to fourpence, to a penny in 1836, and its final abolition, which was carried in Parliament, though not without considerable opposition, in 1855. No stamps are now impressed on newspapers, except for the purpose of transmitting them by post.

One of the earliest English local papers was the Norwich Postman, published in 1706, at the charge of a penny, but 'a halfpenny not refused,' and followed by the Norwich Courant in 1714, and the Weekly Mercury, or Protestant's Packet (also at Norwich, and still in existence), in 1720. The Worcester Postman appeared in 1708, the Newcastle Courant in 1711, the Kentish Post (now the Kentish Gazette) in 1717, and the Leeds Mercury in 1718.

The first newspaper printed in Scotland was the Mercurius Politicus, issued under the superintendence of Cromwell's troops, during their occupation of the citadel of Leith, in 1653. On the 31st December, 1660, appeared at Edinburgh the first number of the Mercurius Caledonius, which had only, however, an existence of about three months. The Caledonian Mercury commenced on 28th April, 1720, its first proprietor being William Rolland, an advocate, and its first editor Thomas Ruddiman. The Edinburgh Gazette dates from 1699, and the Edinburgh Evening Courant from 1718. The first paper published in Glasgow was the Glasgow Courant, on 11th Nov. 1715, followed by the Glasgow Journal in 1729.

Several Irish newspapers appeared in the seventeenth century, such as Ireland's True Diurnal, the Mercurius Hibernicus, and the Irish Courant; but, though referring to Irish affairs, these were all printed in London. The first newspaper actually published in Ireland was the Dublin News-Letter, in 1685, followed by the Dublin Intelligencer in 1690. The Belfast News-Letter and Saunders' News-Letter, both of which still exist, appeared, the former in 1737, the latter in 1754. The Freeman's Journal commenced in 1763.

The repeal of the stamp-duty in 1855, and of the paper-duty in 1861, has given a great impetus to this branch of literature. Not only has the number of newspapers increased, but the circulation of many of those previously in existence has been greatly extended, and their prices lowered. Penny weekly and penny daily papers are now quite common; even halfpenny newspapers are not uncommon, some of them possessing considerable merit, and exercising no small amount of literary and political influence. There are at present over twenty daily newspapers published in London. In 1846 the total number of newspapers was only 549, of which fourteen were dailies. There are now altogether 401 daily and other newspapers in the metropolis, 1177 in the provinces, 80 in Wales, 181 in Scotland, 156 in Ireland, and 20 in the Isle of Man and the Channel Islands. Among daily newspapers the Times, though perhaps the most influential, has not the largest circulation; still its daily issue amounts to about 60,000. The average circulation of the Daily Telegraph is said to have at one time reached the enormous figure of 240,000; the Standard (the leading Conservative newspaper) is said to print of its morning and evening editions together some 250,000 copies daily; the Daily News is the most largely circulated of Liberal newspapers. The Pall Mall Gazette, one of the more recently-founded dailies, has also a good circulation. The great improvements that have taken place in machinery enable such newspapers as the Times to be thrown off now at the rate of 60,000 copies an hour.

No country possesses so many newspapers as the United States of America, the result in a great measure of the republican institutions of the country, and the universal interest taken in political matters by the great body of the community. The earliest newspaper published in the colony was at Boston in 1690, but this was suppressed almost at its first commencement by the authorities, and it was not till 1704 that the Boston News-Letter was started, and became the first regularly established American newspaper. The Boston Gazette commenced in 1719, the printer being James Franklin, who shortly afterwards, in 1721, started the New England Courant, memorable for its connection with his younger brother, the celebrated philosopher, some of whose first attempts at writing were made in this paper, and who himself became conductor of it in 1722. By the commencement of the revolutionary war in 1775 the number of newspapers published in the New England States amounted to thirteen, one of which, the New Hampshire Gazette (commenced in 1756), still exists, being the oldest newspaper in America. In 1800 the number of newspapers had increased to 200, of which several were dailies, the first daily being the Pennsylvania Packet or the General Advertiser, which, under the name of the Daily Advertiser, continued to exist till 1837. From 1800 to 1810 the number and circulation of American newspapers greatly increased. The number in the latter year was 359, of which twenty-seven were dailies. At the last four decennial censuses of the United States the following statistics were obtained regarding the newspapers of that country:—

	1840.	1850.	1860.	1870.	1880.
Dailies.....	138	254	372	542	980
Weeklies,..	1266	2048	2971	4425	8718

New York has ten or a dozen dailies in English, four in German, and two in French. The most widely circulated of these are the New York Herald, the Tribune, and the New York Times. The first mentioned was begun in 1835 by Mr. James Gordon Bennett, a native of Scotland, and the enterprise shown in its management has never been exceeded in the history of the newspaper press. In 1841 the Tribune was begun by Mr. Horace Greeley, under whose management it acquired a high reputation. The New York Times was established in 1850. According to an estimate made for the year 1881 the total number of newspapers and periodicals of all kinds then published in the English language was 16,500, and the total number in all other languages 17,500.

The first newspaper established in France was in 1631, by Theophraste Renaudot, a physician, who had been in the habit for some time previously of presenting to his patients a printed account of the various occurrences of the day, and thus rendered himself extremely acceptable as a medical attendant. What afforded so much amusement to the sick and ailing he justly considered might prove no less interesting to those in the enjoyment of sound health; and accordingly, on the 30th of May of the year above mentioned, the first number of the Gazette, as it was styled, was given to the world. Its success

was fully equal to the expectations of Renaudot, who in October, 1631, obtained letters-patent from the crown, conferring on him and his heirs the exclusive right and privilege of publishing 'the gazettes, news, and narratives of all that has passed or may pass within and without the kingdom.' He died in 1653, leaving the paper to the management of his sons, under whose direction it long continued to flourish. In 1752 the title Gazette was changed to Gazette de France, under which designation it continued to appear till 24th August, 1848, when it was suspended. On the 30th of that month it was resumed under the title of Le Peuple Français, Journal de l'Appel à la Nation, which, on the 14th of September, was again altered to L'Étoile de la France, Journal des Droits de Tous. It again changed its name on 25th October to Gazette de France, Journal de l'Appel à la Nation, under which title it remained. The Gazette Burlesque, a newspaper in verse, was commenced in 1650, under the management of the poet Jean Loret, and presents a very faithful transcript of the *chronique scandaleuse* of Paris of the period. The Mercure Galant was started by Donneau de Visé in 1672, and under the title of the Mercure de France, to which it was changed in 1717, continued to exist down to 1853, when it ceased. It is memorable for its editorship by Marmontel.

An immense impetus was given to the French newspaper press by the revolution, Mirabeau leading the way with his Courrier de Provence. The total number of Journals that appeared from 1789 to 1800 is estimated at 750. Each political party, Girondist, Jacobin, or Royalist, had its organ; but, as might be expected, the predominating influence was exercised by the ultra-revolutionary journals. Among these may be mentioned more especially the Chronique de Paris, edited by Condorcet, the Orateur du Peuple, by Fréron, under the name of Martel, Hebert's Père Duchesne, and above all the notorious Ami du Peuple, conducted by Marat. Of all the newspapers, however, commenced at this eventful period, the only ones which have survived to the present day are the Journal des Débats and the Moniteur. Under the rule of Napoleon the press was subjected to a rigid censorship, which was continued, though in a modified form, after the restoration, and only removed in 1819. It was again imposed shortly afterwards, again removed, and ultimately reimposed in the shape of the celebrated *ordonnances*, which precipitated the revolution of July, 1830. Among the numerous journals started in the reign of Louis Philippe, the most noted are La Presse and Le Siècle, both of which commenced in 1836, the former under the management of M. de Girardin, the latter under that of M. Dutacq. The revolution of 1848 produced a tremendous inundation of newspapers, but for the most part they enjoyed a very brief period of existence. A severe curb was applied to the violence of the press by General Cavaignac, who, on the suppression of the insurrections in June, 1848, suspended eleven of the most noted journals, and among others the Presse and the Assemblée Nationale. Another stringent measure was that passed in 1850, under the presidency of Louis Napoleon, by which all articles contributed to a newspaper were required to be subscribed by their respective authors under a heavy penalty. Still greater restrictions were imposed by the *Decret Organique* of February, 1852, by which the liberty of the newspaper press in France became so circumscribed as to render it in most cases little more than an echo of the sentiments professed by government.

In Germany, as in other countries, we find many pamphlets and fly-leaves published at an early period, some of them as far back as the fifteenth century; but the first regular newspaper was commenced at Frankfort by Egenolph Emmel in 1615, under the title of the Frankfurter Oberpostamtszeitung. The next appears to have been established at Fulda, but the date is uncertain. Then one was started at Hildesheim in 1619, and another at Herford in 1630. By the end of the seventeenth century all the principal towns of Germany had their newspapers. The Hamburgischer Correspondent, which appeared in 1714 as a continuation of the Holsteinische Zeitungscorrespondance, established in 1712, is deserving of notice as the first German newspaper which received its reports of foreign affairs from correspondents resident abroad. The circulation of newspapers, however, in Germany previous to the French revolution was but inconsiderable. The first number of the Allgemeine Zeitung was published in 1798, and, like the Times in England, it soon rose to the highest position in the ranks of German journalism. Like the Times it maintains a regular staff of correspondents throughout most of the countries of Europe. Since 1848 the newspaper press has been very active in Prussia, the principal journals being the Norddeutsche Allgemeine Zeitung, the National Zeitung, the Neue Preussische Zeitung, the Volks-Zeitung, the Vossische Zeitung, the Kölnische Zeitung, &c. In Austria the number of newspapers is comparatively small. Among the most important is the Neue freie Presse.

One of the earliest journals in the Low Countries was the Gazette van Antwerpen, which survived till 1805. During the last century the Annales Politiques had considerable popularity and influence. The freedom granted to the press since the revolution of 1830 has done much to improve the character of journalism in Belgium, and the Indépendance Belge, the Moniteur Belge (1830), the Echo du Parlement, the Journal de Bruxelles, the Emancipation, and the Echo Belge are favourably distinguished for the ability with which they are conducted. The newspapers of Holland were from the first distinguished by the accuracy of the information furnished by them. It was not till 1830 that they began to comment on public occurrences, their criticism having been previously directed to items of commercial intelligence. The principal Dutch journals are the Allgemeene Handelsblad of Amsterdam, the Haarlemsche Courant, the Journal de la Haye, and Staats-Courant, the two latter published at the Hague. The press of Italy, of Spain, of Sweden and Norway, and of Denmark, is, in each instance, comparatively of less importance; but there are evidences of its assuming a more commanding and influential position. The Journal de St. Petersbourg, in French, has a considerable circulation outside of Russia. Turkey and Greece are now in possession of numerous journals, which cannot fail to exercise considerable influence as educational and civilizing agencies.

We shall now conclude this article by a sketch of the management of a London daily paper. Employed upon each morning paper there are an editor and several sub-editors; in most cases a certain number of regular reporters at salaries from four to six guineas per week each; a regular staff of compositors in the printing-office; a number of readers, who correct the proofs as they come from the compositors; reading-boys, whose duty it is to read the copy aloud whilst the reader makes his corrections upon the proof; a master-printer; and a certain number of men and boys to attend to the printing-machine and to take off the papers as they fall from the cylinders; a publisher and sub-publishers; a staff of clerks to receive advertisements and keep the accounts; porters; errand-boys, &c. The salary of an editor upon a respectable morning paper is from £600 to £1200 per

annum; and a sub-editor receives from £400 to £600 per annum. Besides the regular reporters of a newspaper there are several occasional, or, as they are called, 'penny-a-line,' reporters, from the circumstance of their furnishing articles of intelligence at a fixed price per line, namely, 1½*d.* or 1½*d.* They are not attached to any particular newspaper. The aggregate charge for copy furnished by these persons forms a considerable item in the weekly expenditure of a newspaper. The chief editor's duty begins, strictly speaking, with the publication of the evening newspapers. He has to read their leading articles and to refute or support their arguments. He remains at his post until a late hour, prepared to write comments on the foreign papers as they arrive (a duty in which he is generally assisted by a foreign editor or a sub-editor), and to direct leading articles to be written on topics of interest before the public. During the sitting of Parliament he is compelled frequently to remain at the office until two or three o'clock in the morning; and such is the energy with which the public press in the metropolis is directed that it is not rare to see a leading article of nearly a column written at two o'clock in the morning on some subject which had been discussed an hour or two previously in the House of Commons. On the literary staff of the leading papers there are also usually a city editor who has charge of the commercial news; critics who attend the principal dramatic and musical places of entertainment, art exhibitions, &c.; besides the regular provincial, foreign and special correspondents. The most extraordinary part of a morning paper is the reporting. Most of the reporters are gentlemen of education, and frequently law students. During the Parliament, the sittings of which commence at four o'clock in the afternoon, the reporters of the leading papers attend by turns, one succeeding the other according to previous arrangement, each remaining in the house for half or three-quarters of an hour, and the reporters of the minor papers much longer. If the debate is not heavy the reporter in the House of Commons when relieved enters a small room at the end of the lobby, which has been appropriated exclusively to reporters, and there transcribes or arranges his notes of the speeches delivered during his turn. He then proceeds at once to the office of the newspaper on which he is engaged. His slips as they are written are given by the printer to the compositors; and as one reporter follows another it is not unusual for a debate terminated (let us suppose) at twelve o'clock at night to be set up in type and ready for printing by two o'clock in the morning. So active and able are some of the reporters that it is not an unfrequent thing for one reporter to supply from the notes of three-quarters of an hour to the paper upon which he is engaged from two to three columns of closely-printed matter.

NEW STYLE. See CALENDAR and EPOCH.

NEWT, or EFT, the popular name applied to various genera of Amphibians included in the order Urodela ('tailed') of that class. The Newts are *Caducibranchiate* forms; that is, the gills, with which, in common with all other Amphibians, they are provided in early life, disappear on their attaining maturity. Two pairs of limbs are always developed. The skin is destitute of scales, or other form of exoskeleton. The tail remains permanent, and may be rounded, as in the Land-newts, or compressed laterally, as in the Water-newts. The latter, or 'Water-salamanders,' as they are sometimes termed, possess a compressed tail, adapted for swimming. These forms are oviparous; that is, produce eggs from which the young are afterwards hatched. It must be borne in mind that although these forms are aquatic in their habits they are yet strict air-breathers, and respire in their adult state exclusively by lungs—in the same manner, indeed, as the whale, which, although exclusively aquatic, yet breathes by means of lungs. The larval gills are thus 'caducous,' or are cast off on maturity being reached, which period is attained about the third month of existence. The larval tail is retained throughout life; in the Frogs and Toads this tail becomes rudimentary when the adult stage is reached. The tongue of the Water-newts is free. There are two rows of teeth borne on the palate. The front legs appear first in order of development, and possess four toes; the hinder feet being provided with five digits. The male animals are distinguished by the possession of a crest or fleshy ridge borne on the back. The food consists chiefly of aquatic insects, larvæ, &c. The *Triton cristatus*, or Great Water-newt, measures about 6 inches in length when fully grown. It is coloured dark brown on its upper parts, the sides being of a whitish colour, whilst the belly is of an orange colour spotted with black. The *Triton aquaticus* averages about 3 inches in length; and both species are common in our fresh-water pools and ponds.

The Land-newts or Land-salamanders are included under the genus *Salamandra*. The tail in these animals is of rounded or cylindrical form, and is therefore not adapted for swimming. The young are produced in an ovo-viviparous manner; that is, the eggs undergo part of their development before they are extruded from the parent-body. The head is large, and the tongue of broad conformation. The palatal teeth are arranged in two elongated rows. The Land-newts possess skin or cutaneous glands which secrete a fluid of watery nature; and the popular superstition that if put on a fire these creatures were able to quench the flames may have taken origin from the abundant secretion of these glands. The *Salamandra maculosa* of Southern Europe is a familiar species, as also is the *S. Alpina* found inhabiting mountainous situations. These forms possess the power of reproducing lost or mutilated toes or even limbs.

NEW TESTAMENT. See BIBLE.

NEWTON, SIR ISAAC, the most distinguished mathematician and philosopher of modern times, was born at Woolsthorpe, in Lincolnshire, December 25, 1642. He was the son of Isaac Newton, farmer and proprietor of the manor of Woolsthorpe, who died several months before his birth. He was sent at an early age to the village school, and in his twelfth year to the town of Grantham. While here he displayed a decided taste for philosophical and mechanical inventions, and some knowledge of drawing being necessary in these operations he applied himself without a master to the study. After a short period, however, his mother took him home to manage the farm; but his irresistible passion for study and science finally induced her to send him back to Grantham, where he remained till his eighteenth year, when he was entered at Trinity College, Cambridge, 5th June, 1660. A taste for mathematical studies had for some time prevailed there; the elements of algebra and geometry usually formed a part of the course, and Newton had the good fortune to find the celebrated Dr. Barrow professor. In order to prepare himself for the lectures Newton read the text-books in advance, and proceeded at the age of about twenty-one to study the works of Wallis. He appears to have been particularly delighted with the celebrated treatise of that author entitled Arithmetica Infinitorum. As a result of his study of this work in 1663–64 he discovered the celebrated formula known as Newton's Binomial Theorem (see BINOMIAL); and before 1665 he had established his celebrated Doctrine of Fluxions. Eleven years later Leibnitz again discovered this invaluable

method, and presented it to the world in a different form—that of the differential calculus. Newton collected these important discoveries in a manuscript entitled Analysis per Æquationes Numero Terminorum Infinitas, but did not communicate them to any one.

About this time (1665), being obliged to quit Cambridge on account of the plague, he retired to Woolsthorpe, and now turned his attention more closely to subjects of natural philosophy. As he was one day sitting in his garden (at least such is the current story) the fall of an apple led him to reflect on the nature of that remarkable principle which urges all bodies towards the centre of the earth. He considered that if the moon was retained about the earth by terrestrial gravity, the planets, which move round the sun, ought similarly to be retained in their orbs by their gravity towards that body. Having determined the law of the gravity of the planets towards the sun he endeavoured to apply it to the moon, that is, to determine the velocity of her motion round the earth by means of her distance, as settled by astronomers, and of the intensity of gravity, as shown by the fall of bodies at the earth's surface. To make this calculation it is necessary to know exactly the distance from the surface to the centre of the earth; but unfortunately at that time there existed no correct measure of the earth's dimensions. (See DEGREE.) Newton was obliged to employ the imperfect measures then in use, and found that they gave for the force which retains the moon in her orbit a value greater by one-sixth than that which results from her observed circular velocity. This small difference seemed to his cautious mind a strong proof against his bold conjecture. He imagined that some unknown cause modified, in the case of the moon, the general law of gravity indicated by the motion of the planets. Yet he did not abandon his leading notion, but determined to wait till study and reflection should reveal to him this supposed unknown cause. In 1666 he returned to Cambridge, was chosen fellow of his college (Trinity College) in 1667, and the next year was admitted A.M. In 1668, however, Mercator published his Logarithmotechnia, in which he had obtained the area of the hyperbola referred to its asymptotes by expanding its ordinate into an infinite series, which was the main secret of Newton's method. Barrow showed this work to Newton, who immediately gave him his own treatise (the Analysis, &c.), but did not yet publish it.

In the course of 1666 his attention had been accidentally drawn to the phenomena of the refraction of light through prisms. His experiments led him to conclude that light, as it emanates from the radiating bodies, is not a simple and homogeneous substance, but that it is composed of a number of rays, endowed with unequal refrangibility, and possessing different colouring properties. More than two years elapsed before he returned to his researches on this subject; but in 1669, being appointed Lucasian professor of mathematics, and preparing to lecture on optics, he endeavoured to mature his first results, and composed a complete treatise, in which the fundamental properties of light were unfolded, established, and arranged by means of experiments alone, without any mixture of hypothesis—a novelty at that time almost as surprising as these properties themselves.

In 1672 Newton was chosen a fellow of the Royal Society, to which he communicated a description of a new arrangement for reflecting telescopes, which rendered them more convenient by diminishing their length without weakening their magnifying powers, and soon after, the first part of his labours on the analysis of light. When the first feelings of surprise and admiration excited by this noble work had subsided, the society appointed three members to study it fully and report upon it. Hooke, being one of the members, undertook to draw up the report. Instead of discussing the new facts as presented by the experiments of Newton, he examined them merely in relation to his own hypothesis—that light is simply the effect of vibrations excited and propagated in an elastic medium—and concluded by allowing whatever appeared reconcilable with his own hypothesis, and by advising Newton not to seek any other explanation of the facts. Newton in reply (Phil. Trans. vii.) adduces new experiments confirming his former results, and refutes the objections to the production of whiteness by the mixture of all the rays. To several other attacks (particularly one by Huygens), which appeared in the Philosophical Transactions, he was obliged to reply. In vain did he declare that he neither advanced nor admitted any hypothesis whatever, and that his sole object was to establish and connect facts by means of the laws of nature. So much was he disgusted with these difficulties that he gave up his intention of printing his lectures on Optics with his treatise on Series. Before quitting the lists, however, he addressed another paper (1675) to the Royal Society, completing the account of his results and of his views on the nature of light. This treatise, united with his first paper on the analysis of light, afterwards served as the base of the great work, Treatise on Optics (1704), in which, however, the experimental investigation of the phenomena is more extensive and more strictly separated from all hypothesis. In his paper of 1675, after excusing himself for proposing a conjecture as to the nature of light, and declaring that it had no connection with the facts which he had discovered, he goes on to give one which he should be inclined to consider most probable if he were obliged to adopt any. He then admits the existence of an imperceptible fluid (which he calls *æther*), extending everywhere in space, and penetrating all bodies with different degrees of density. This fluid he considers as highly elastic, and consequently pressing against itself and the material parts of other bodies with an energy proportional to its actual density. If this æther be disturbed or agitated in any one point by any cause which produces a vibratory motion, this motion must transmit itself by undulations through all the rest of the medium; and if these undulations encounter in their passage the material particles forming the substance of any body they will agitate them with considerable force. Now light, he asserts, consists of a peculiar substance, different from the æther, but composed of heterogeneous particles, which, darting in all directions from luminous bodies with great velocity, agitate the æther in their passage and excite undulations. In 1679 Newton had occasion to write to Hooke about a system of physical astronomy on which the Royal Society had asked his opinion. Hooke and Newton held conflicting opinions, and Newton having examined by mathematical calculations a position maintained by Hooke found that an attractive force, emanating from a centre, and acting inversely as the squares of the distances, would produce motions exactly resembling the planetary motions both in regard to the form of the orbit and the velocity of the body at each point. This was the secret of the system of the world; but it still remained to account for the discordance of the moon's motion, which had before (1665) embarrassed Newton. But in 1682, having learned the results of the new measurement of a degree by Picard, he resumed his former calculations from these data. Finding, as he advanced, the manifest tendency of these numbers to produce the long-desired results, he became so much agitated as to be unable to go on with his

calculation, and requested one of his friends to finish it. Two years were spent in penetrating the consequences of this discovery, and preparing his immortal work Philosophiæ Naturalis Principia Mathematica; but it was not till 1686 that he concluded to present his work to the society, at the expense of which it was printed in 1687. Not more than two or three of his contemporaries were capable of understanding it, and more than fifty years elapsed before the great physical truth which it contained was thoroughly understood by the generality of scientific men.

In 1687 Newton was one of the delegates sent by the University of Cambridge to maintain its rights before the High Commission court when they were attacked by James II., and in 1688 he was elected by the university to the convention Parliament, but never distinguished himself in that body. He had always taken great interest in chemistry, and constructed a small laboratory for prosecuting his investigations, and seems, after the publication of the Principia, to have devoted almost his whole time to them.

In 1696 he was appointed warden of the mint, a general recoinage having then been undertaken. In this office he rendered essential service, and in 1699 was made master of the mint. In 1701 he was again returned to Parliament by his university; in 1703 he was chosen president of the Royal Society; and in 1705 was knighted by Queen Anne. In 1704 he gave to the world his Optics (in English, translated into Latin by Dr. S. Clarke), which contains all his researches on light. Other works published about this time were his Arithmetica Universalis (1707; more complete, 1712); Methodus Differentialis (1711); and his Analysis per Equationes Numero Terminorum Infinitas (1711). We have already given an account of the celebrated dispute between Newton and Leibnitz (1712) in the article LEIBNITZ. The Princess of Wales (daughter-in-law of George I.) was fond of conversing with him. Newton having one day explained to her a system of chronology which he had composed for his amusement, she requested a copy for her own use. A copy was also given to Abbé Conti, who immediately published it without Newton's knowledge; and it therefore became necessary to prepare a more correct edition, which appeared in 1728 under the title Chronology of Ancient Kingdoms amended. His observations on Daniel and the Apocalypse (1733) is an attempt to show the fulfilment of the prophecies.

At this period of his life the reading of religious works, with the conversation of his friends, formed almost his only relaxation after performing the duties of his office. He had almost ceased to think of science. His countenance was rather calm than expressive; his manner rather languid; his health was good until his eightieth year, when he suffered from a calculous disorder, which occasioned his death, March 20, 1727. On the 28th he was interred in Westminster Abbey. His statue, by Roubiliac, stands in Trinity College, Cambridge. Horsley's edition of his works (five vols. 4to, 1779–85), with the Opuscula, collected by Castillon (three vols. 4to, Lausanne, 1744), and his Letters, inserted in the Biographia Britannica, contains nearly all his printed works. The best edition of the Principia is that of Lesueur and Jacquier (four vols. 4to, Geneva, 1739–42; four vols. 8vo, Glasgow, 1822). A Life of Newton, by Sir David Brewster, appeared in 1831; but having had full access given him to the great mass of Newton's papers, which are preserved by the noble family of Portsmouth, Sir David was induced to write a new biography, which is now the standard (two vols. 8vo, 1855).

NEWTON, JOHN, a celebrated English divine, was born in London 24th July, 1725, and after attending a school at Stratford in Essex for nearly two years was, when eleven years old, taken to sea by his father, who was then master of a ship in the Mediterranean trade. His subsequent life was of a rather irregular description until his thirtieth year, when he resolved to quit the sea, and after acting for some time as a tide-waiter at Liverpool, during which period he applied himself assiduously to the study of Greek and Hebrew to qualify himself for holy orders, he was ordained to the curacy of Olney in Buckinghamshire in 1764. During his incumbency at Olney, which continued for sixteen years, he became acquainted with the poet Cowper, and a close and lasting intimacy sprung up between them, Newton acting as the spiritual director of the poet, who contributed sixty-eight hymns to the collection published by his friend in 1776, well known by the title of the Olney Hymns. In 1779 Newton was presented by his friend John Thornton to the living of the united parishes of St. Mary Woolnoth and St. Mary Woolchurch Haw, Lombard Street, and held it till his death in 1807. His works consist mainly of his Autobiography (1764); a Review of Ecclesiastical History (1770); the Olney Hymns; Cardiphonia; Letters of Omicron (1762); besides numerous sermons, tracts, and miscellaneous writings.

NEWTONARDS, a town, Ireland, county Down, at the north extremity of Lough Strangford, and on the Belfast and County Down Railway, 9 miles east of Belfast. It consists chiefly of a handsome square, and several streets leading into it; is well built, and has an elegant town-hall, a court-house and market square, an Episcopal church, one Roman Catholic, eight Presbyterian, and two Methodist chapels; several schools, a union workhouse, &c. The principal manufactures are muslin weaving and embroidery, flax spinning and weaving, hem stitching by machinery, &c., which give employment to a great number of female workers. Pop. (1881), 8676.

NEWTONIAN SYSTEM, the modern system of physical astronomy as distinguished from the modern system of formal astronomy, which is the 'Copernican,' or rather the 'Keplerian' system.

NEWTON-IN-MACKERFIELD, a township, Lancashire, 15 miles east by north of Liverpool, on the Liverpool and Manchester Railway, consists chiefly of one broad street with some good houses. Here are large print and paper works, and in the vicinity are bottle and flint glass works, and extensive collieries. There are places of worship for Episcopalians, Roman Catholics, and Congregationalists, and several schools. Races take place annually in July on a large common near the town. Pop. in 1881, 10,580.

NEWTON'S LAWS OF MOTION. 1. Every body continues in its state of rest, or of uniform motion in a straight line, except in so far as it may be compelled by impressed forces to change that state. 2. Change of motion is proportional to the impressed force, and takes place in the direction of the straight line in which the force acts. These are the first two laws; they are employed in the article MECHANICS. Thomson and Tait, in their Treatise on Natural Philosophy, show that these laws give a definition and a measure of force, that they teach how to compound and to resolve forces, and to fully investigate the motion of a particle subjected to given forces. 'Though Newton perceived that the parallelogram of forces, or the fundamental principle of statics, is essentially involved in the second law of motion, and gave a proof which is virtually the same as the preceding [see the article MECHANICS for this proof], subsequent writers on statics (especially in this country) have very generally ignored the fact; and the

consequence has been the introduction of various unnecessary dynamical axioms, more or less obvious, but in reality included in or dependent upon Newton's laws of motion' (§ 223). Newton's third law enables complex cases of motion to be investigated, especially those in which there are mutual actions between or amongst two or more bodies, such as, for instance, attractions or pressures, or transference of energy in any form. The law is—To every action there is always an equal and contrary reaction: or, the mutual actions of two bodies are always equal and oppositely directed. Newton appends in a scholium to this law a remarkable statement, which may be put into modern scientific language as follows:—Work done on any system of bodies [in Newton's words, the parts of any machine] has its equivalent in work done against friction, molecular forces, or gravity, if there be no acceleration; but if there be acceleration, part of the work is expended in overcoming the resistance to acceleration, and the additional kinetic energy developed is equivalent to the work so spent. This is an admirably distinct and compact statement of the fundamental principle of the modern science of energy.

NEWTON'S RINGS, rings of coloured light produced by interference at the two surfaces of a thin film of air or water or other transparent substance, inclosed between a very slightly convex lens and a plane surface of glass. (See INTERFERENCE.) These rings were first examined by Sir I. Newton. The colour of the light sent to the eye from any part of the film depends on the thickness of the film. The thickness of film necessary to produce a particular colour depends on the index of refraction of the substance of which the film is composed. Thus, if red is produced by a thickness of 9 millionths of an inch of air, the same colour will be produced by a thickness of $6\frac{3}{4}$ millionths of an inch of water, or $5\frac{3}{4}$ millionths of an inch of glass. The thickness is less when the index of refraction is great.

NEWTON-STEWART, a town, Scotland, county of Wigton, and 7 miles north by west of Wigton, on the right bank of the Cree. It has a large and handsome Gothic church; several other churches; an endowed academy, and other schools. The manufactures are of woollen and cotton goods. Many of the inhabitants are employed in the lead-mines, which are worked to a considerable extent in the vicinity, in Kirkcudbrightshire. Pop. in 1881, 2645.

NEWTOWN, a parliamentary borough and market-town, North Wales, county Montgomery. It is situated in a beautiful valley, on the right bank of the Severn, crossed here by a handsome stone bridge, 8 miles south-west of Montgomery, and on the Montgomery Canal. It has an ancient church (now in ruins) in the early English style; a parish church, a modern brick structure; several Board schools; a market hall, &c.; extensive manufactures of flannel, several fulling-mills and bleaching-grounds; a large foundry; and tanneries. Newtown unites with the Montgomery district of boroughs in sending a member to Parliament. Pop. in 1881, 7170.

NEW YEAR'S DAY, the first day of a year. (Respecting the determination of the same see articles YEAR, EPOCH, and CALENDAR.) We shall treat of it in this place as a festival. It is natural for man to distinguish this day, which begins one of the great divisions of his life; and such we find to be the case with most civilized nations. The civil year of the Jews began with the month *Tisri*. It was considered as the day in which God holds judgment, and also as the anniversary of the day on which Adam was created.—The Romans offered sacrifices on new year's day to Janus, particularly a white steer. In the city much incense was burned, and the newly-elected magistrates went in procession to the capitol, where they sacrificed to Jupiter. The success of any affair on that day was considered a good omen for the whole year. Presents called *strenæ* were given. The emperors made these presents a heavy tax, and they became at length so burdensome that Claudius limited them by a decree. Henry III. of England seems to have imitated the Roman emperors in extorting new year's presents; and Elizabeth principally supported her jewel chest and her enormous wardrobe by levying similar contributions. The Druids are said, on certain days, to have cut the sacred mistletoe with a golden knife in a forest dedicated to the gods, and to distribute its branches with much ceremony as new year's gifts to the people. Among the Saxons this day was also observed by gifts, accompanied with festivities. Similar customs existed with other German tribes, accompanied by many superstitious observances, and to this very day a number of ceremonies, originally superstitious, but now serving principally to excite mirth, are practised in Germany on the night of the last of December and first of January. New year's day, being the eighth day after Christmas, is the festival of Christ's circumcision. The day is a holiday, celebrated with religious service all over the European continent, though not in England nor in the United States. At an early period most Christians celebrated new year on our 25th of March. In Germany this was the case till the ninth century, and in England even to 1752. At a later time it was changed to December 25, and so continued in Germany until the fourteenth century. Of modern nations the French celebrate new year with the most spirit. In Scotland new year's day is a much more general holiday than in England, and visits, congratulations, and presents are common. In England new year's presents are not so frequent as Christmas gifts. In New York a custom exists (probably a remainder of Dutch manners) of paying visits of congratulation on new year's day.

NEW YORK, one of the thirteen original United States of North America, bounded on the north by Canada, the St. Lawrence, and Lake Ontario; west by Canada and Lake Erie, south by Pennsylvania, New Jersey, and the Atlantic; and east by Connecticut, Massachusetts, and Vermont. Inclusive of Long Island, it has an area of 49,170 square miles. The surface in the south-east is traversed by several mountain ranges from New Jersey, one of which, crossing the Hudson, presents a bold and lofty front on both banks, and forms magnificent scenery. The Catskill Mountains have the greatest average height, and in Round Top attain 3084 feet; but the culminating point is Mount Marcy, which belongs to the Adirondack range, and has a height of 5467 feet. This range, situated in the north-east of the state, is the watershed between Lake Champlain and the St. Lawrence and Lake Ontario. In the west the large tract extending between Lake Ontario on the north and Pennsylvania on the south is generally level. Few states can boast of being better watered. In addition to the St. Lawrence and the Niagara, which it shares with Canada; and the Delaware, which it shares with Pennsylvania, it has exclusive possession of the Hudson, which pursues its whole course of above 300 miles within the state, and for at least half this distance is available for navigation. The lakes are developed still more magnificently than the rivers; the larger (Lakes Erie, Ontario, and Champlain) are common to other states and territories. Besides these, however, numerous minor lakes are diffused over the interior, and not only enhance the beauties of the scenery, but often form a kind of chain, easily connected by canals and

railways so as to afford peculiar facilities for transport. Among these are Lake George, communicating with Lake Champlain, 37 miles long, from 1 to 7 miles broad, and studded with above 200 beautiful islets—Cayuga and Seneca each 40, Oneida and Crooked each 22, Chautauque 18, Skaneateles 15, and Canandaigua 14 miles in length. To these water thoroughfares of the interior must be added the not less important communications with the Atlantic along the coasts of Long Island, which forms a dependency of the state, and the noble bay and harbour of New York. The climate, much modified by local circumstances, is somewhat variable, but with some local exceptions very healthy. The soil is in general of only indifferent fertility. The largest crops are oats, Indian corn, wheat, barley, and, to a greater extent than any other state, potatoes. Much attention is paid to the rearing of stock, both for feeding and for dairy purposes, more milk being produced than in all other states of the Union combined, and more butter and cheese than in any other state. Iron, lead, copper, and zinc are mined to a limited extent; and quarries of marble, granite, freestone, and gypsum have been opened in many districts. The mineral springs of Saratoga and Ballston are the most celebrated in America. Manufactures have made great progress. The foreign trade is so extensive as to amount to rather more than a third of the whole carried on by the United States. The internal trade is also of great importance. It is carried on chiefly by canals and railroads in conjunction with the Hudson. The length of railways opened for traffic in the state at the end of 1882 was 7037 miles. Among religious denominations the Protestant Episcopalian, which, previous to the revolution, was the Established church, still continues to be the wealthiest and most influential, though in respect of adherents it is outnumbered by several other bodies. Of these the largest are the Roman Catholics, who claim about one-tenth of the whole population; the Episcopal Methodists, Baptists, and Presbyterians. For the higher branches of education provision has been made, chiefly by Union College, Schenectady; New York University and Columbia College, New York; Madison University, Hamilton; Hamilton College, Clinton; and St. John's College, Fordham. Primary education is provided by dividing the whole state into organized public school districts. In connection with these schools, in many of which education is free, are two normal schools and a teachers' institute for each county; and in addition to them are numerous private schools. The legislature consists of a Senate and Assembly—the former, thirty-two in number, elected for two years; and the latter, 128 in number, elected annually. The state is divided into sixty counties. It returns thirty-three members to the National House of Representatives, and has thirty-five votes for president. Albany is the capital, though New York is the most important city. The territory of New York was reached by Champlain in July, 1609. It was explored in September, 1609, by Henry Hudson, an English navigator in the service of the Dutch East India Company. In 1611 the Dutch states-general offered special privileges to any company which should open a trade with the natives of this region. During the next ten years many trading voyages were undertaken, and several settlements were made on the Hudson, and one at Fort Orange, Manhattan Island. The whole territory claimed by the Dutch was of great and indefinite extent, and received the name of New Netherlands. The English disputed the claim, and finally expelled the Dutch in 1674. During the war with the French the country was laid almost desolate by the ravages of war and the incursions of Indians; but the Peace of Paris, which gave Canada to the British, enabled the inhabitants to repair their disasters. Slavery was abolished in the state in 1817. Pop. in 1870, 4,382,759; in 1880, 5,082,871.

NEW YORK, the chief city and seaport of the state of New York and of the United States, and in respect of population and commerce the metropolis of the American continent. The city is admirably situated at the confluence of two navigable rivers, the Hudson from the north, and East River from the north-east, their united waters expanding into New York Bay, which extends southward to the ocean at Sandy Hook, about 18 miles from the city. East River is, strictly speaking, an estuary connecting Long Island Sound with New York Bay. This great bay is divided into an upper and a lower bay by Staten Island, which at a point called the Narrows is less than a mile distant from the Long Island shore. Here are located Forts Hamilton, Lafayette, and Wadsworth, the chief defences of the harbour. The Upper Bay, encircled by the wooded shores of Long Island and Staten Island, and the cities of New York, Brooklyn, and Jersey City, is regarded as one of the most beautiful bays in the world.

The Hudson River, known locally as North River, bounding the city on the west, at a point about 12 miles above its mouth, opens out eastwardly through Spuyten Duyvel Creek into Harlem River, an arm of East River. The tidal channel thus formed cuts off from the mainland that portion of the city known as Manhattan Island. Prior to 1873 the charter limits included only Manhattan Island, Blackwell's, Ward's, and Randall's Islands in the East River, and Governor's, Bedloe's, and Ellis' Islands in the Upper Bay. In that year the city was enlarged by the annexation of 12,000 acres of the mainland east of Harlem River, embracing the towns of Morrisania, West Farm, and Kingsbridge in Westchester county. The limits are thus extended northward to the southern line of the city of Yonkers, and eastward to the Bronx River, which, with the East River into which it flows, forms the eastern boundary of the city. East River, by a bend to the westward, also bounds the city on the south, the Hudson, as already stated, bounding it on the west. The irregular parallelogram thus formed has an extreme length from south to north of 16 miles, an average width of 2½ miles, with an area of 26,500 acres.

The approach to New York from the sea is either north or south of Long Island. The northern approach through Long Island Sound and East River was formerly impracticable for large vessels, by reason of the rapid currents and sunken rocks at Hell Gate. But this channel has now been made safely navigable, a large area of sunken ledges, after six years' labour in tunnelling, having been shattered by a single explosion of nitro-glycerine in 1876. Further excavations are now in progress. The southern and principal approach is by the channel between Long Island and Sandy Hook. This channel is obstructed by a sandbar which limits the depth of water to about 21 feet at low water, but gives 27 feet when the tide is full. Inside the bar is a vast harbour with deep water and safe anchorage. Vessels of the largest class pass freely through the Narrows and lie at the city wharves, as also at those of Jersey City and Hoboken across the Hudson in New Jersey, and of Brooklyn across the East River on Long Island.

Plan of the City.—The south-western extremity of the city is known as the Battery, so called from an ancient fortification erected here by the Dutch. It is now a park of 21 acres tastefully laid out. From this point northward for a distance of about two

miles the streets, with the exception of Broadway and the Bowery, are mostly narrow and irregular. The plan upon which the newer portion of the city is laid out consists of parallel *avenues*, 100 feet and more in width, named numerically from *first* to *eleventh*, and running from south to north as far as the northern extremity of Manhattan Island, intersected at right angles by *streets* also numerically named, and crossing the city from east to west. This plan has its beginning at First Street, next north of Houston Street on the east side of the city, and is fully developed north of Fourteenth Street, which is the first of the streets which cross the city uninterruptedly from river to river. Four short avenues east of First Avenue are named with letters A, B, C, D, and intermediate between Third and Fourth Avenues is Lexington Avenue, and between Fourth and Fifth Avenues another named Madison. Fifth Avenue is the great central avenue, and all the streets running east from it have the prefix *east*, and those running west the prefix *west*, and the houses are numbered accordingly. Thus: No. 1, 2, 3, &c., East Fourteenth Street, and No. 1, 2, 3, &c., West Fourteenth Street.

Principal Streets.—The main business thoroughfare is Broadway, which in the activity and variety of its business, the elegance of its shops and stores, and the massiveness and grandeur of many of its public and private buildings, is one of the most interesting streets in the world. Beginning at Bowling Green adjoining the Battery at the southern extremity of the city, Broadway runs in a north-easterly direction for 2½ miles in a nearly straight line; then turning westward to a northerly direction it pursues its way to Fifty-ninth Street, a distance of 5 miles from its starting-point, with an average width of 80 feet. South Street running along the East River front, and West Street along the Hudson or North River, are devoted mainly to the shipping business. Wall Street, the financial centre of the western world, opens out of Broadway on the east, directly opposite Trinity Church, and runs to the East River. In it are located the United States Custom-House, Sub-Treasury, and Assay Office, and numerous banking-houses. Broad Street, opening out of Wall Street toward the south, contains the Stock Exchange, the great Mills building with over 1000 occupants, besides brokers' and bankers' offices without number. Fulton Street crossing Broadway below the City Hall, and lined with retail stores, is about the most crowded of all the city streets. Park Row leads eastwardly from Broadway, between the Post-Office and the Herald building, to Printing House Square, around which are located the offices of the Tribune, Times, Sun, and World, and most of the other daily journals. Further eastward is Chatham Square, running northward from which is the Bowery, crowded with cheap retail shops, beer-gardens, variety theatres, concert saloons, and exhibitions of all kinds of monstrosities. It is one of the widest streets in the city, and is more German than American in the population with which it swarms. The Third Avenue Elevated Railroad runs through the entire length of the Bowery. In the newer and more regularly planned portion of the city, the most conspicuous streets are the broad parallel avenues running north and south as already described. Of these Fifth Avenue is *par excellence* the fashionable and aristocratic street. It begins at Washington Square, and runs northward past Madison Square, along the entire length of Central Park on its eastern side, to the end of Manhattan Island at Harlem River, an extreme length of about 7 miles, with a uniform width of 100 feet. The southern half of this avenue is built up compactly with elegant and costly mansions, magnificent churches, and fashionable hotels. Madison Avenue, beginning at Twenty-third Street and running northward to Harlem River, is next east of Fifth Avenue, with which it vies as a street of costly private houses and beautiful churches. Most of the other avenues are business streets.

Public Conveyances.—Three lines of omnibuses now run from the Brooklyn ferries through Broadway. There are about 30 distinct lines of horse-cars or tramways traversing the city in all directions; but these proving unequal to the ever-increasing tide of travel have been supplemented by elevated railroads with steam motors giving a speed of 10 miles per hour. There are at present four distinct lines running the whole length of Manhattan Island. The elevated roads are built of wrought-iron, and the road-bed is supported upon massive wrought-iron columns firmly set in the street below. Ferry-boats cross the North and East Rivers at all hours conveying multitudes of people living in the suburbs, as well as travellers by the southern and western railroads having their terminus in Jersey City and Hoboken, or by the Long Island railroads terminating in Brooklyn and Long Island City. It is a singular circumstance that in this great city there is but one railroad depot, the Grand Central at the corner of Fourth Avenue and Forty-second Street, into which are brought, by a bridge across Harlem River and a massive viaduct mostly underground, the trains of the great Eastern, Northern, and North-Western Railroads. The demand for something better, however, led to the construction of East River Bridge, the largest suspension-bridge now existing, connecting New York with Brooklyn. This bridge, 5989 feet long and 85 wide, costing over $15,000,000 (£3,000,000), was opened May 24, 1883. The great width of the Hudson opposite the city, and the necessity of keeping it an unimpeded highway of commerce, preclude all projects for spanning it by a bridge; but a private company has made considerable progress in the construction of a tunnel, by which it is expected that the trains of southern and western railroads will pass under the river directly into the city.

Public Parks.—Of these the most important is Central Park, situated near the centre of Manhattan Island, and extending from Fifty-ninth Street on the south to One Hundred and Tenth Street on the north, with Eighth Avenue for its western border and Fifth Avenue for the Eastern. Its length is 2½ miles and its width a little more than half a mile, giving an area of 840 acres. Originally an unpromising stretch of rocky ledges and stagnant swamps, Central Park has been made one of the most picturesque and beautiful pleasure-grounds with which any city in the world is adorned. Riverside Park is a narrow strip of rocky bluff and wooded slopes stretching for three miles along the bank of the Hudson. Union Square on the east side of Broadway, and Madison Square on the east side of Fifth Avenue, are small but ornamental parks brilliantly illuminated at night by electric lights. About a dozen other small parks are located at different points.

Architecture.—New York is rapidly redeeming itself from the charge of monotony in the style and appearance of its buildings. Different shades and qualities of building-stone are furnished by the quarries of Nova Scotia and various states of the Union; and red and yellow brick with terra-cotta ornamentation have come extensively into use. Good examples of the latter combination may be seen in the new Produce Exchange, Fulton and Jefferson Market Houses, the Casino in Moorish style, and the Knickerbocker Apartment House at the corner of Fifth Avenue and Twenty-eighth Street. The high price of building-lots, and the improvement in the

construction of elevators or 'lifts,' have stimulated the building of lofty structures both for business offices and dwellings; and the church steeples are not more conspicuous on entering the harbour than some of these towering edifices, such as the Produce Exchange, the Welles building, and the Washington, all fronting upon Bowling Green at the foot of Broadway. Other business structures are the Equitable, Boreel, and Telegraph buildings on Lower Broadway, the Mills building in Broad Street, the Post building in the rear of the Custom House, and the Morse, Kelley, and Tribune buildings on Printing House Square. The buildings most worthy of notice in this part of the city, in an architectural aspect, are the Treasury building in Wall Street, a chaste and dignified structure in white marble with Doric porticoes on both Pine and Wall Streets; the City Hall, also of white marble in Italian style, attractively set in the centre of an ornamental park; the 'Tombs,' one of the city prisons, a fair example of Egyptian style, and Jefferson Market Court House on Sixth Avenue, a very successful attempt in Italian Gothic, built of red brick and sandstone. The new Post Office at the south end of City Hall Park is a very large and costly structure, and one of the most conspicuous in the city. It is built of light-coloured granite, and covers about 60,000 square feet of ground. In the newer parts of the city are the Academy of Design, built of gray and white marble, and patterned after a Venetian palace; Columbia College on Madison Avenue; Victoria Hotel, fronting on Broadway, Twenty-seventh Street, and Fifth Avenue; and numerous palatial private houses on Fifth Avenue, Madison Avenue, and other streets adjacent to Central Park. A marked improvemeut in style is manifest even in less costly and smaller houses. The most conspicuous buildings, however, are the new 'apartment houses,' some of which cover entire city blocks and attain a height of 10 and 12 stories. Among the largest and finest of these structures are the Florence, near Union Square; the Knickerbocker, a massive balconied building of buff Milwaukee brick; the Berkshire, a very large house on Madison Avenue; the Dakota, an immense and costly edifice resembling a French chateau, and fronting Central Park; and the group of lofty fire-proof houses known as the 'Navarro Flats,' occupying the block between Fifty-eighth and Fifty-ninth Streets on Seventh Avenue. Numerous other apartment houses are in process of erection.

The Churches of all denominations number about 500. They are mostly supported from pew-rents and voluntary contributions. A few of the older societies of the Episcopal and Dutch Reformed denominations are richly endowed, and have means sufficient to maintain numerous churches, chapels, parochial and industrial schools and charities in different sections of the city. Of the numerous church buildings worthy of notice the most conspicuous are: Trinity Church (Episcopal), on Broadway at the head of Wall Street, a noble Gothic structure of brown sandstone built in 1846, with tower and steeple 284 feet in height. Grace Church (Episcopal), a handsome Gothic building in white marble built in 1845. Standing at the point where Broadway turns sharply from a north-eastern to a northern course, at Tenth Street, it is a conspicuous landmark distinctly visible as far down as Bowling Green. St. George's (Episcopal), on Stuyvesant Square, a chaste and imposing example of plain Gothic in brown sandstone, with double tower and spire. St. Thomas's (Episcopal), on Fifth Avenue, built in 1870 of brown stone, a beautiful church in Gothic style. Fifth Avenue Presbyterian Church, of decorated Gothic, on Fifth Avenue. Calvary Church (Baptist), of white marble, with graceful spire, lately erected in West Fifty-seventh Street. All Souls (Unitarian), a quaint-looking structure in Byzantine style. St. Patrick's Cathedral, occupying the block on Fifth Avenue between Fiftieth and Fifty-first Streets, dedicated in 1879. It is built of white marble in the decorated style of the thirteenth century. This is the largest and most imposing church edifice in the country. Jewish Temple Emmanuel, Fifth Avenue, of brown and yellow sandstone, rich and beautiful in design, is the finest example of Moorish architecture in the States.

Benevolent and Charitable Institutions.—New York is generously provided with institutions of all kinds for the relief of human suffering. The largest and best appointed hospitals are Bellevue, New York, Roosevelt, St. Luke's, Mount Sinai, St. Vincent's, German, Woman's, and the great Charity Hospital, one of the city institutions on Blackwell's Island in the East River. Bloomingdale Asylum for the Insane, overlooking the Hudson River, and the Asylum for Deaf-Mutes, also on the Hudson at One Hundred and Sixty-second Street, are important charities. A large institution for the blind is located on Ninth Avenue. A few of the most conspicuous charities, whose purposes are indicated by their titles, are the following: Children's Aid Society, Five Points House of Industry, Home for Fallen and Friendless Girls, Home for Incurables, Howard Mission and Home for Little Wanderers, Association for Improving the Condition of the Poor, N. Y. Infant Asylum, Presbyterian Home for Aged Women, R. C. Orphan Asylum, Sheltering Arms, Sisters of the Strangers, First Aid to the Injured, St. John's Guild, United Hebrew Charities, Working Women's Protective Union, Society for Prevention of Cruelty to Animals, Young Men's and Young Women's Christian Associations; Tract, Bible, and Missionary Societies, and numerous charitable societies of the various nationalities.

Hotels.—There are in the city more than 150 respectable hotels, varying of course in style and price, and differing also in the plan on which they are kept. By what is known as the American plan, a fixed price per day or week is charged for a room, and meals at the *table d'hôte*. By the European plan the guest is charged only for room and service, and he takes his meals *à la carte*, either at the restaurant of the hotel or elsewhere as he prefers. Of first-class hotels on the American plan some of the more conspicuous are the Fifth Avenue, Windsor, St. Nicholas, Metropolitan, Park Avenue, Grand Central, New York and Westminster. On the European plan the leading hotels are the Brunswick, Buckingham, Brevoort, Grand, Clarendon, Everett, Gilsey, Hoffman, and St. James.

Education.—The Public School system is maintained at a cost of about $5,000,000 (£1,000,000) annually, which is raised by taxation. The estimate for the year 1884 is considerably above that amount. The whole number of schools is 300, including two normal schools, one nautical training-school, and the college of the city of New York. The whole number of pupils in attendance is about 300,000. By a law of the state the attendance of children from 8 to 14 years of age is made compulsory. The schools offer a superior education free of cost to children in all grades of society, the course of instruction including modern languages, vocal music, &c., in addition to the ordinary English studies. Boys desirous of a classical or scientific training have free access, on examination, to the Free College, in which there are now nearly 1000 students, 13 professors, and 17 tutors. The most important seat of learning in the city is Columbia College, founded by charter of

George II., in 1754. Its buildings now cover the block bounded by Madison and Fourth Avenue and Forty-ninth and Fiftieth Streets, and new buildings are in process of erection on the block adjoining. The college has 60 instructors and about 1500 students. The University, on Washington Square, was founded in 1831. It has a large corps of instructors and about 800 students. Cooper Union is a noble monument of its founder, the late Peter Cooper, who in his lifetime expended upon it over $2,000,000 (£400,000). Its various free schools are attended by about 4000 students annually. The College of Physicians and Surgeons is the Medical Department of Columbia College, and the University Medical College sustains a similar relation to the University. A third allopathic school is Bellevue Hospital Medical College. In these and in the Homœopathic Medical College about 2000 students receive instruction annually. The principal theological schools are the Theological Seminary of the Protestant Episcopal Church, located in the middle of Chelsea Square; the Union Theological Seminary of the Presbyterian Church, open to all Christian denominations; and the Roman Catholic College of St. Francis Xavier in East Sixteenth Street.

Amusement.—More than thirty places of theatrical amusement are nightly open during the 'season,' catering to every variety of taste. The principal theatres are the Grand Opera House, Madison Square, Niblo's, Union Square, Star, Wallack's and the new Casino. There are two opera houses, the Academy of Music, and the Metropolitan Opera House, both large and costly structures, the last opened in 1883. In addition to these there are the usual entertainments of all great cities, such as concerts, lectures, dramatic readings, and exhibitions of various kinds. In the summer months there are within easy reach the great seaside watering-places—Manhattan Beach, Brighton, Rockaway, Fire Island, Long Beach and Long Branch—beside a great variety of delightful excursions by steamboats up the Hudson or on Long Island Sound.

Art Collections.—Properly speaking there are no permanent art galleries in New York. A creditable step in this direction was taken in the formation of the Metropolitan Museum of Art in 1870. It has one large building erected in Central Park, and possesses the famous Di Cesnola collection of statuary, pottery, glassware, gold and silver ornaments, &c., consisting of over 10,000 objects found in ancient cities and tombs of Cyprus. The museum has also a valuable collection of Flemish and Dutch paintings, and a loan collection of modern paintings, statuary, antiquities, &c. Some good modern paintings and portraits of public men are to be seen in the galleries of the Historical Society, the American Art Gallery, and Lenox Library. The National Academy of Design, the American Water-Colour Society, and the Society of American Artists give annual exhibitions of new paintings. The most admired statues are those of Washington in Wall Street, a very noble full-length statue in bronze; of Washington (equestrian) in Union Square; of Admiral Farragut in Madison Square; of Franklin in Printing House Square; Shakespeare, the Indian Hunter, and the Seventh Regiment Soldier in Central Park. The most interesting historical monument in the park is the Obelisk presented to the city by Ismail Pasha, late Khedive of Egypt.

Libraries.—The largest and most valuable library is the Astor, containing 208,000 volumes. It is a free library, for which the city is indebted to the munificence of the Astor family. The Mercantile, with 200,000 volumes, a fine circulating library belonging to its members, but accessible to students wishing to consult its valuable books of reference in the library rooms. The Lenox Library, with its costly fire-proof building fronting Central Park, and its collection of rare books numbering 30,000, valuable manuscripts, choice paintings, sculptures, ceramics, &c., was the gift of the late James Lenox.

Clubs.—These peculiarly London institutions have had a slow growth in New York, and although there are thirty or forty clubs in existence, some of them very wealthy and prosperous, they are looked upon by the great mass of citizens as exotics. The principal are the Century, Knickerbocker, Liederkrans, Lotos, Manhattan, New York, Union, Union League, and University.

Business.—New York is primarily a commercial city and a centre of distribution of domestic and foreign products, but it is also the centre of a vast manufacturing interest. In the year ending June 30, 1883, the total imports were $508,700,475 (£101,740,095); exports, $376,688,680 (£75,337,736); customs duties collected, $144,489,070 (£28,897,814). The vessels which entered numbered: American, 1900 of 1,025,762 tons; foreign, 4353 of 5,414,771 tons; total, 6253 of 6,440,533 tons; vessels cleared: American, 1500 of 904,272 tons; foreign, 4374 of 5,423,418 tons; total, 5874 of 6,327,690 tons. On the 2d Oct., 1883, there were 592 national, state, and private banks, having an aggregate capital of $130,519,700 (£26,103,946). The amount of city tax in 1883 was $29,167,000 (£5,833,400); the net city debt $92,546,000 (£18,509,200).

City Government.—Under the legislative charter of 1873 the government of the city is vested in a board of aldermen, elected annually, and a mayor, elected once in two years. The different departments of Public Works, Finance, Law, Police, Charities and Corrections, Fire, Health, Park, Docks, Taxes and Assessments, and Street Cleaning are managed by commissioners appointed for six years by the mayor, with the approval of the board of aldermen. A few only of the city interests under the care of these commissioners need to be referred to.

Water.—The water supply is furnished from Croton Lake, an artificial reservoir supplied by Croton River, from which the water is conveyed, by an aqueduct of stone masonry of a capacity of 115,000,000 gallons per day, a distance of 40 miles to New York, and distributed through about 400 miles of main pipes. A necessity has already arisen for an increased supply of water, and a commission is now considering plans for the enlargement of the existing works. The city is lighted by six private gas companies. The electric light both for streets and houses is also coming rapidly into use. *Police.*—The police force consists of 3000 men. The cost of the system is about $4,000,000 (£800,000) annually. *Docks.*—These consist of piers and wharves constructed almost entirely of wood, and not at all creditable to a city of such wealth and commercial importance. A plan for stone piers and wharves has been adopted, and one or two have been built. *Charitable and Correctional Institutions.*—These are almost wholly located on the islands in East River. Upon Blackwell's Island are the penitentiary, almshouse, lunatic asylum for females, workhouse, blind asylum, charity hospital, hospital for incurables, and convalescent hospital. Upon Ward's Island are the insane asylum for males, and the homœopathic hospital. A part of this island is also occupied by a state emigrant hospital, a lunatic asylum, houses of refuge, a nursery for children, and a home for invalid soldiers. On Randall's Island are the house of refuge, idiot asylum, nursery, and other city charities for children.

The Islands in the Bay.—Governor's, Bedloe's, and Ellis' Islands are occupied by the United States

government for purposes of defence. On Governor's Island the major-general in command of the military department of the Atlantic has his headquarters. Upon Bedloe's Island is to be placed Bartholdi's colossal statue of Liberty Enlightening the World, the foundations for which are now being laid.

History.—Manhattan Island was first visited in 1609 by Henry Hudson, an English navigator in the employment of the Dutch East India Company. It was first settled three years after on the southern extremity. The settlement here formed gradually grew into a town, which in 1648 had 1000 inhabitants. In 1664 it surrendered to the British, and took its new name from the Duke of York, into whose hands it came. In 1673 the Dutch regained possession, but lost it finally in the following year. In 1700 the population was 6000. A slave-market was established in 1711. In 1712 and 1741–42 negro insurrections occurred. In the latter the city was fired and many people killed; 119 negroes were executed in consequence. In 1732 stages departed monthly for Boston, taking a fortnight on the route. New York was taken by the British at the beginning of the war of Independence (26th August, 1776), and held by them till its close (evacuated 25th November, 1783). In 1807 the first steamboat was built to ply on the Hudson. The opening of the Erie Canal in 1825 gave the city a pre-eminent command of internal commerce. In 1835 and 1845 New York was visited by disastrous fires. In 1853 an international industrial exhibition was held. The first charter of the city was granted by James II. in 1686, confirmed by Queen Anne in 1708, and again confirmed, with modifications, by George II. in 1732. This charter remained in force with little change for a hundred years. Several charters have been adopted by the state legislature since 1830, the latest being that of April 30, 1873, under which the present government is organized. The progress of New York has been rapid, almost beyond example, though its prosperity has repeatedly suffered both from external and internal causes. Its occupation by the British during the revolutionary war isolated it from the rest of the Union, and the Anglo-American war of 1812–15 almost annihilated its foreign commerce; while on the other hand speculative mania has prevailed on different occasions to such an extent as to bring on revulsions, by which thousands of individuals have been involved in ruin, and the general progress most seriously retarded. The local government of the city has in recent times been the subject of great official mismanagement and malversation, which have added greatly to the debt. Pop. (1830), 202,000; (1860), 805,000; (1870), 942,292; (1880), 1,206,600; or including the suburbs within a radius of 20 miles, about 2,500,000.

NEW ZEALAND, a group of islands belonging to Great Britain, in the South Pacific Ocean; lat. 34° 20′ to 47° 30′ S.; lon. 166° to 178° E., and consisting of two large islands, called North and South Island, and several small ones; length of the group, north to south, measured on a line curving nearly through their centres, about 1200 miles; area estimated at 105,340 square miles. Previous to 1876 New Zealand was divided into nine provinces; four in the North Island (Auckland, Taranaki, Wellington, and Hawke's Bay), and five in the South Island (Nelson Marlborough, Canterbury, Otago, and Westland); but in 1876 the provinces were abolished, and the whole of New Zealand is now divided into 63 counties. The first census of the colony by counties took place in 1878, when it was found that the entire population amounted to 414,412. According to the census of 1881 the population numbered 489,933—males, 269,605; females, 220,328; exclusive of 44,099 Maories and 5004 Chinese, the great bulk of the latter being employed in the mines.

North Island, the most northern of the group, and separated from South Island by Cook's Strait, which, where narrowest, is about 25 miles wide, is very irregular in shape, and much broken by deep bays and projecting headlands. Its area is estimated at 44,736 square miles. It consists of a main body with projections running east, south, and west, and a long narrow projection 280 miles in length, and tapering from 53 to 8 miles in breadth, which stretches north with a curve in a westerly direction. This remarkable peninsula is nearly cut through by Hauraki Gulf or the Firth of the Thames on the east, and Manukau or Symonds' Harbour on the west; the only land which saves its continuity being the narrow isthmus on which, like that of ancient Corinth, the town of Auckland has been built. Its west coast, with exception of the indentations formed by the harbours of Manukau, already mentioned, and of Kaipara, is almost a continuous straight line, whereas the whole of the east coast is a constant succession of bays and promontories, including the Bay of Islands, Wangari Bay, Wangarou Harbour, Doubtless Bay, &c. The second of the four peninsulas stretches E.N.E., between the Bay of Plenty on the north, and Hawke Bay on the east. It is much more compact than the former, having both a shorter length and a greater width, and beside Hawke Bay itself has no marked indentation, except that of Poverty Bay on the east. The third peninsula forms the southern extremity of the island, and stretches for 130 miles, between Hawke Bay and the west part of Cook's Strait, to its termination at Cape Palliser. The fourth peninsula, which projects less than any of the other three, is, in some respects, the most conspicuous of all, in consequence of containing the lofty volcanic mountain of Egmont or Taranaki, and being partly composed of the streams of lava which at some remote period have flowed from its sides. The main body of the island, as well as its peninsulas, has, for the most part, a very rugged and mountainous surface; and besides being traversed from south to north by chains of mountains such as the Te Whaiti, the Kaimanawa, the Ruahine, the Puketoi, and the Tararua Range, presents a number of lofty isolated peaks, among which the most conspicuous are Tongariro and Ruapehu, near the centre of the island, the former 6500 feet, the latter 9195 feet high, and Taranaki, near the west coast, 8280 feet high. Sedimentary rocks, chiefly of gray sandstone, are often seen, both among the ridges of the interior and on the coast, where they frequently form precipitous cliffs; but the far greater part of the rocks are crystalline, and so evidently volcanic that their sides have all the appearance of continuous lava streams; while the intervening valleys and plains are in many instances literally covered with the pumice-stones which their craters must have ejected when in a state of activity. The streams which descend from the mountains are extremely numerous, but are mostly mere torrents, which bring down immense deposits of shingle. The largest of the rivers are the Waikato, augmented by the Waipa. The former rises in Mount Ruapehu, and, after helping to form Taupo Lake, flows northward for the greater part of its course for a distance of 100 miles, when, passing through a gorge of hills along the coast, it turns sharply to the west, emptying itself into the North Taranaki Bight. It is navigable by small steamers for fifty miles, and its estuary can be entered by the largest vessels. Its tributary, the Waipa, has a course of about 40 miles before it joins its left bank. The Wanganui rises near the centre of the island, and after a course of 120 miles falls into the South Taranaki Bight. The

only other considerable streams are the Manawatu, farther south; the Waiho or Thames, falling into Hauraki Gulf and the Wakatane, emptying into the Bay of Plenty. Most of the streams have their sources in lakes embosomed among mountains and magnificent forests, and presenting scenes of extraordinary beauty. The largest of all the lakes is Taupo, situated near the centre of the island, of an irregular triangular shape, about 36 miles long, by 25 miles broad. About 35 miles north-east from it is Lake Roto-Rua, which forms nearly a perfect circle of 8 miles in diameter; and is remarkable for the number of hot springs which rise close to its banks. Wairarapa, and several other lakes near the south extremity of the island, cover an area of about 50,000 acres. In the same locality is one of the most extensive plains of the island, occupying an area of above 600 square miles.

South Island is of a much more compact and regular form, and though bulging out somewhat towards the south, may be considered as a parallelogram, stretching about 500 miles from N.N.E. to S.S.W., with a medium breadth of about 130 miles; area, about 55,225 square miles. In the north, where it is separated from North Island by Cook's Strait, it is very much rugged and broken, and so much corresponds with the opposite coast, both in its general structure and the direction of its headlands and submerged reefs, as to suggest and furnish good ground for the opinion that the two islands were at one time contiguous. But with exception of the north coast, and a remarkable spur on the east coast called Banks' Peninsula, the coast-line is very continuous, presenting no indentations deserving of notice except Blind Bay and smaller inlets on the north, Pegasus Bay and Otago Bay on the east, and numerous small bays and fractuosities on the south and south-west. Its interior has not been thoroughly explored, but it presents physical features similar to those of North Island, and in particular is traversed from north to south by a lofty central chain, which is evidently a continuation of that which terminates on the opposite coast of the northern island. This chain has an average height of about 8000 feet; but Mount Cook, near the west coast, in lat. 43° 30′ S., has two peaks, the one 12,200 feet, and the other 13,200 feet high. Both in the interior and along the coast several extensive plains exist. The Canterbury Plains extend for 100 miles on the east side of the island. The drainage is effected by numerous streams, which flow directly east or west to the sea, and seldom lose the character of impetuous mountain torrents. The largest river is the Clutha, which has a course of 150 miles, and enters the sea near the south-east angle of the island. There are a number of lakes, generally situated among the mountains at a considerable elevation. The largest is Wakatipu, covering 114 square miles.

Stewart Island is separated from South Island by Foveaux Strait, about 15 miles wide. It is of a triangular form, with an area estimated at 1300 square miles. Its shores are wooded to the water's edge, while numerous bays, separated by rocky headlands covered with brushwood, indent the coast, which is fringed, more especially towards the south, with numerous islands. The largest of these indentations are Paterson's Inlet on the north-east, a noble harbour; and the fine harbour of Pegasus Bay in the south-east. The interior is mountainous, but none of the summits exceeds 3200 feet.

A great number of smaller islands belong to the New Zealand group, and for the most part are situated at a short distance from the shores of the North and South Islands, though many surround Stewart Island. The largest are Otea or Great Barrier Island and Shoutourou, in the entrance, and Waiheki Reef, in the interior of the Firth of Thames; Kapiti or Entry Island, in Cook's Strait; D'Urville at the north-east entrance of Blind Bay, Resolution on the south-west coast of the Middle Island, and the Snares on the parallel of 48° S.S.W. of Stewart Island.

Geology.—Almost all the loftier summits bear obvious indications of having been either volcanic cones or craters, and in the truncated cone of Tongariro the volcanic force is still active. Many other parts bear manifest signs of frequent upheavements and violent convulsions, and since 1846 numerous shocks of earthquake have been felt, particularly at Wellington, where, in October, 1848, the shocks were so violent as to shatter most of the houses and public buildings, and spread general terror and dismay. The prevailing rocks of the mountain chains in which the volcanic peaks are situated are metamorphic schists, gneiss, clay-slate, porphyry, and basalt. Granite seems to be of rare occurrence, but isolated masses of quartz occur in various places. On the east coast, near the Bay of Islands, there are seams of lignite 4 feet thick. The geological structure of South Island resembles that of North Island, but with an absence of volcanic action. New Zealand is rich in remarkable fossils of birds. The most extraordinary of them is the Gigantic Moa (*Dinornis giganteus*), some species of which must have been from 10 to 14 feet high. The natives affirm that it is not extinct, and that living specimens of it still exist in the almost inaccessible forests of the interior. With mineral wealth New Zealand is liberally supplied. Coal has been found in many parts of the country—in Blind Bay near Nelson, in Auckland, and of fine quality near the Buller River, on the west coast of Nelson; while the whole of the mountainous peninsula forming the north-west corner of this province appears to be stored with coal. Iron is found in many localities, and some of the rocks on the Otago shore are powerfully magnetic. The beach at New Plymouth for several miles is formed of fine iron sand, which adheres to a magnet in crystallized particles. Copper has been worked on a small scale at the Kawau and Great Barrier Islands, near Auckland, and chrome and copper are derived from the Dun Mountain Mine at Nelson. Gold has been found in various parts. In the North Island the chief locality producing it is the Thames Valley, near Auckland. It has also been obtained in Nelson province. But the chief discoveries of the precious metal have been made in the districts of Otago and Canterbury (including in the latter the county of Westland), in which vast districts have been found rich in auriferous deposits. The first discovery was made in June, 1861, and in 1865 rich deposits were found at Hokitika (Westland). Large mining operations are at present carried on in the district of Otago and in Westland, but the amount is gradually decreasing. The total amount exported up to March, 1882 (exclusive of specie), has been valued at £38,502,000. A considerable proportion of the miners, whose earnings average from about £75 to £100 a year, are Chinese.

Climate.—This, in a country stretching through 12° of latitude, covered by mountain ranges, several of them clothed with perpetual snow, and exposed along an east coast of above 1500 miles to the tempestuous winds and dense clouds which are carried from the Antarctic circle to the warm regions of the north, is necessarily very much diversified. The characteristic feature in the climates of both principal islands is humidity. At Auckland the annual quantity of rain is 51·84, whereas in London it is only 20·05. Throughout the North Island the mean annual temperature calculated on observations made at the Bay of Islands, Auckland, and Wellington, is rather more

than 58°, and the range of the thermometer is very limited. At the Bay of Islands it is only 20°, varying from 55° in the coldest to 75° in the warmest months, and at Wellington 22°, ranging between 48° and 70°; whereas in London the range is 26°, varying between 36° and 62°. The prevailing winds are from the north-west and the south-west and are accompanied with frequent hurricanes, particularly in Cook's Strait, which acts as an immense funnel through which the tempest rages almost without intermission, and at all seasons. From Cook's Strait southward, along the east coast of South Island, the climate becomes less agreeable; the wind increases both in quantity and violence, and the winter cold is much aggravated by icy blasts and southern sleet. The climate of New Zealand is remarkably healthful; and although at Auckland the number of days in which rain falls annually is 190, yet other parts of the islands enjoy a larger number of dry days, even if the total quantity of rain that falls be not any less. The summer months of December and January, and the autumn months of February, March, and April, are the driest.

Vegetation, &c.—New Zealand, with the adjoining groups of islands, forms a botanical centre from which a peculiar class of vegetable forms is supposed to have issued. The species are nearly equally divided between the monocotyledonous, the cellular, and the dicotyledonous plants. To the cellular belong numerous varieties of algæ, lichens, fungi, and more especially ferns (130 different species), which, replacing the Gramineæ of other countries, form almost the only vegetation over immense districts. Some of them are more than 30 feet high, and remarkable for the elegance of their forms. One of the most common is the *Pteris esculenta*, the root of which is used as food by the natives and greedily devoured by pigs, which, in consequence of its abundance, are now running wild in great numbers. Another remarkable plant of great economical value (even furnishing an article of export) is the flax-plant (*Phormium tenax*), which is found in almost all situations, on the driest hills, in swamps, and on the sea-shore within reach of the spray. One species of the plant has leaves 12 feet and flower-stalks 20 feet long. The finest flax is obtained from a cultivated variety. Among the dicotyledonous plants the most remarkable belong to the Coniferæ and Taxideæ, and furnish valuable descriptions of timber. Among others is the Kauri or Damar pine, with a smooth gray columnar trunk from 30 to 40 feet in circuit, and nearly of the same girth through its whole height of from 60 to 90 feet. One remarkable fact connected with it is that it is confined to a comparatively small part of the North Island, and to land which seems specially rugged and unfertile. The soil and climate of New Zealand produce in perfection every English grain, grass, fruit, and vegetable. Wheat, potatoes, onions, apples, plums, peaches, and their congeners, are excellent in quality, and the peach bears profusely as a standard. In the gardens of the warmer valleys fruits of a semi-tropical character—the pomegranate, citron, orange, and olive—might be raised. The vine does not in general thrive particularly well. Maize; the taro, a native of the Sandwich Islands; and the kumera, a sweet-potato, are partially cultivated by the natives in sheltered sunny spots of the North Island; but under common field cultivation maize will not ripen. Geraniums and myrtles, attaining a shrub size, and various plants which require the greenhouse in England, flourish through the winter in the open air. The rapid progress which the colony has made of late years in agriculture may be seen from the following comparison of the number of acres under corn crops and in grass in 1871 and 1882:—

	Corn crops.		Grass.
1871	223,288	.....	776,492
1882	700,341	.....	1,771,875

These figures show that the attention of the New Zealand colonists is mainly directed to the rearing of live stock. In the number of sheep possessed by the colony New Zealand is now ahead of all the other Australian colonies except N. S. Wales. In 1861 the number was 2,761,383, which in 1871 had increased to 9,700,629, and in 1882 to 12,985,085. The increase in horses and horned cattle is in about the same proportion.

Zoology.—In animals New Zealand is singularly deficient. Captain Cook found no trace of any quadrupeds except a sort of fox-dog and a few rats, and no others have since been discovered. As already mentioned there are pigs now running wild as well as cats. Pheasants, partridges, quails, and red and fallow deer have been introduced, and have so far thriven successfully. All the other common European quadrupeds appear to be easily acclimatized. There are eighty-three species of native birds, of which the bell-bird and the tui are good songsters. The apteryx, a peculiar bird so called from having no wings, is one of the most remarkable of the native birds. The common garden bee, introduced with signal success, frequently swarms in the woods. Several varieties of whales and seals were so abundant on the coasts when first visited, that great hopes were entertained of establishing productive fisheries of them; but the capture of them was pursued so ruthlessly, without sparing the breeding-whale and her young, that a most important source of revenue has been almost destroyed. The coast still teems with fish, among which one of the best is the hapuka, resembling the cod, but superior to it both in nutritive properties and flavour, and weighing from 10 to 70 lbs., and occasionally 100 lbs. River fish are scarce and poor.

Natives.—The natives of New Zealand, called Maories, a people of Malay origin, are supposed to have immigrated from the Sandwich Islands some centuries ago. Split up into numerous petty tribes, and wasting each other by internecine feuds, their numbers have been so reduced that they do not now exceed 45,000, all of whom, with the exception of a few hundreds, are located in the North Island. In personal appearance they somewhat resemble deeply-bronzed gipsies. By missionary efforts a great part of them have been converted to Christianity; many of the young can read and write their own language, and the Bible has been largely circulated amongst them. They have acquired in many instances considerable property in stock, cultivated lands, coasting vessels, flour-mills, and specie; a few even have accounts at the banks, and others have taken shares in local companies. In the neighbourhood of the settlements they are adopting articles of European dress, but they cling to a great extent to their old degraded domestic habits.

Constitution, &c.—By the constitution conferred upon the country in 1853 it is governed in the following manner:—The crown appoints the governor and four judges, but the general government of the colony is vested in the General Assembly, which holds its annual session at Auckland, and is composed of a Legislative Council, consisting of forty-five leading colonists nominated by the governor for life; and in the House of Representatives, which is made up (since 1881) of ninety-five members elected by the people every three years. The governor is aided and advised by a ministry comprising the chief officers of state, who are members of the General Assembly. By the act passed by the assembly in 1875, which abolished the provincial system, the powers previ-

ously exercised by superintendents and provincial officers was delegated to county councils or vested in the governor. The civil and criminal laws are the same as those of England, and the administration of justice is under the care of a chief-justice, and four puisne judges, besides judges of the district courts and resident or stipendiary magistrates. Each of the provinces into which New Zealand was divided previous to 1876 had its own regulations for the purchase and procuring of land, and these regulations have been continued with various modifications by the Land Act of 1877 with its amendments of 1879 and 1882. In the South Island the crown has extinguished by purchase the native title over all the lands; in the North Island this has only been partially effected, the native title still existing over large tracts, though in Auckland an extensive area has been opened to European occupation. Crown lands are divided into three classes:—town and village lands, being the sites reserved or to be reserved for towns or villages; suburban lands, being land near any town lands; and rural lands, being lands not reserved for towns or villages or other public purposes. Town or suburban lands may be acquired either by purchase at auction in sections, the size and upset price of which are fixed by the Land Board subject to the governor's approval, or by application. The town sections are usually rectangular areas of one quarter acre each, the upset price being £7, 10*s*. per quarter acre; the suburban sections are from two to fifteen acres, upset price £3 per acre. Village lands if surveyed into sections of less than one acre are offered at not less than £5 per section, though in special districts the price may be £2, 10*s*. These lands are intended for the abodes of country tradesmen, or of those engaged in road-making, fencing, or other country work. If surveyed into sections of over one acre but not exceeding fifty acres they are termed small-farm allotments, and the price is not less than 20*s*. per acre. Small-farm allotments can also be had on lease, with or without a purchasing clause. Rural lands, whether agricultural, pastoral, or forest, vary in price from the mere cost of surveying under the homestead system of Auckland and Westland, up to £2 per acre in the system before survey in Canterbury. Land can be purchased on the system of deferred payments by persons of 18 years and upwards. The extent of lands of the three classes purchasable by one person is limited, and the limits differ in the various districts.

Religion and Education.—The Church of England has six bishops in New Zealand. It is partly supported by home grants, partly by lands set apart for church purposes, and partly by voluntary contributions. Roman Catholicism and Wesleyan Methodism are also well represented. Presbyterianism prevails in Otago. Formerly each province had its own educational system; but in 1877 an act was passed by the general assembly of the colony establishing a uniform system, to be kept up by government grants alone at the rate of £3, 15*s*. per scholar in average attendance. The act is to be administered by school committees acting under the direction of 12 district boards. Only secular instruction is to be given in the state schools. On January 1st, 1882, the number of schools open was 869, the average number of scholars in attendance being 64,744, instructed by 2087 teachers. There is a university in Otago, and colleges at Auckland, Canterbury, and elsewhere.

Railways, Commerce, &c.—On March 31st, 1882, there were 1333 miles of railway in New Zealand open for traffic, being a large increase over the number open at the same date in the previous year, and a greater number than in any other Australian colony. Several hundred additional miles are in course of construction or projected, chiefly in South Island, but a main line is projected from Auckland to Wellington, embracing the whole length of the North Island with the exception of the northern promontory. There were in April, 1882, 234 telegraph stations, 3824 miles of telegraph lines, and 9653 miles of wire laid in New Zealand. The number of despatches sent during the year was 1,438,772. The principal ports of New Zealand are, in North Island, Auckland, Napier, and Wellington; in the South Island, Port Chalmers, the port of Dunedin, Nelson, Lyttelton, the port of Christchurch, and Invercargill. The principal towns are Auckland and Dunedin, and Wellington, the seat of government. In 1881 the total tonnage of the shipping entered and cleared was 833,621, of which by far the largest portion belonged to British vessels. The total value of imports was £7,457,045; exports, £6,060,866. The chief exports were wool and gold, the former to the amount of 59,368,832 lbs., and to the value of £3,477,993 to Britain alone. The organization of manufacturing industry is actively promoted by government, but the manufactures are as yet insignificant. The government revenue for 1882 was £3,448,170, the expenditure £3,278,820; the gross amount of the public debt was £29,946,418.

History.—New Zealand was first discovered by Tasman in 1642, but little was known of it till the visits of Cook in 1769 and 1774. Its coasts were afterwards repeatedly visited by whalers and others; but the first permanent settlement was made in 1815, when a missionary station was established in the Bay of Islands. It had been long recognized as a British possession, but no regular authority was established by government till 1833, when a resident was appointed, with very limited powers, and subordinate to the government of New South Wales. In 1840 it was erected into a colony, and in 1841 was formally separated from New South Wales and placed under its own independent governor. A great obstruction to the progressive prosperity of the colony has arisen in the disaffection of the natives. In 1843 some of them, repudiating the sale of certain lands which they had made to the New Zealand Company, began to commit many acts of trespass and petty violence, and at length broke into open rebellion. The friendly tribes united with the colonists and the military, and a long and desultory warfare ensued, the available troops being insufficient to effectually suppress the rebels. The settlers were driven from their holdings, and many left the country, and trade, immigration, and agriculture were stopped. More than once the insurrection appeared to be quelled, when fresh outbreaks occurred. The Waikato district in Auckland province, Taranaki, and several districts in Wellington and Hawke Bay, have been the most disturbed. But after the native confederacies in these parts seemed to have been broken up, a fresh outburst took place in October, 1866, in the neighbourhood of Napier, in Hawke Bay, which was terminated by a successful attack upon the rebels' pah or fort at Omarunui, on the Tutaekuri River, since which the country appears to have become generally pacified.

NEW ZEALAND FLAX. See FLAX (NEW ZEALAND).

NEW ZEALAND SPINAGE (*Tetragonia expansa*), a succulent trailing plant, destitute of beauty, inhabiting that country whose name it bears, as well as Tasmania, Australia, Norfolk Island, South America, and Japan. It has been introduced into Europe and America as a substitute for spinage, over which it has this advantage, that if watered it will produce leaves of the greatest succulency throughout the whole summer.

NEY, MICHEL, Duke of Elchingen, Prince of the Moskwa, marshal and peer of France, grand cross of the Legion of Honour, knight of St. Louis, and several orders in foreign countries, was born on 10th January, 1769, at Sarre-Louis, in the department of the Moselle. He was of humble origin, and at an early age (1788) entered the military service. From a private hussar he rose by degrees to the rank of captain in 1794, when his courage and military skill were observed by General Kléber, who gave him the command of a corps of 500 men, and in 1796 appointed him adjutant-general. He soon surpassed the expectations which he had excited, and in 1796, at the battle of Rednitz, was made general of brigade. Notwithstanding his rank his impetuous courage often led him to expose his person like a private soldier. He contributed essentially to the victory of Neuwied in 1797. After a valiant defence he was taken prisoner at Diernsdorff, and on his liberation in 1798 was made general of division. As such he commanded on the Rhine in 1799, and by an able diversion at Manheim contributed to the victory of Masséna at Zurich over the Russians under General Korsokoff. Ney also distinguished himself under Moreau, particularly at Hohenlinden. In 1802 he was sent ambassador to the Helvetic Republic. In 1805 he commanded in the camp at Montreuil, and was appointed by Napoleon marshal of the empire and grand cross of the Legion of Honour. He opened the campaign of 1805 against Austria by a brilliant victory at Elchingen, 14th October (whence he received his title Duke of Elchingen), and brought about the capitulation of Ulm. He occupied the Tyrol, and marched on to Carinthia, when he was stopped in his career by the Peace of Presburg. In 1806 and 1807 he fought at Jena, and after the capture of Magdeburg at Eylau and Friedland. In 1808 he maintained his high reputation in Spain. Napoleon recalled him, but kept him at a distance till the commencement of hostilities against Russia, when he received the chief command of the third division of the imperial forces. He commanded the centre at the battle of Moskwa, and so distinguished himself as to earn the title of Prince of Moskwa. In the conduct of the retreat, in which he commanded the rear-guard, his ability, valour, and devotion were conspicuously manifest, and he exerted himself to the utmost to save the wreck of the army which Napoleon and Murat had deserted. In 1813 he decided the victory of Lützen, assisted at Bautzen and Dresden, but was defeated by Bernadotte at Dennewitz. He was now obliged to retire to Torgau, but soon took the field again; chased the Swedes from Dessau, and fought with his wonted valour at Leipzig, where he received a wound, and afterwards at Hanau. When the enemy entered France he disputed every step of their progress. Brienne, Montmirail, Craonne, and Châlons-sur-Marne are shining names in the history of his battles. When Paris was taken and the emperor was vacillating Ney was the first who ventured to suggest to him that the contest would soon assume the character of a civil war unless it were brought to a speedy termination. Thus he had an important influence upon Napoleon's abdication. After this event Ney took the oath of allegiance to the king, was made a peer, and received the cross of St. Louis and the command of the cuirassiers, dragoons, chasseurs, and light-armed lancers. He enjoyed the most marked distinction at court, and appeared to be entirely devoted to the Bourbons. When Napoleon landed on his return from Elba Ney collected a considerable force, was appointed its commander, and with many assurances of his zeal and fidelity to the king marched against the invader. But soon noticing the desertion of his soldiers and their inclination for Napoleon he regarded the cause of the Bourbons as lost; and being solicited by the emissaries of Napoleon he joined him at Lyons on the 13th of March, and thus opened his way to Paris. In the war of 1815 Napoleon gave him the command of his left wing, which engaged with the British at Quatre-Bras. The charge made by General Gourgaud from the lips of Napoleon himself that Ney's conduct in this engagement was the cause of all the disasters of the campaign has been fully refuted by Gamot by means of a copy of the written orders which the marshal received on that fatal day. At Waterloo he led the attack on the British centre, and after five horses had been killed under him remained last upon the bloody field. His clothes were full of bullet-holes, and he fought on foot till night in the midst of the slain. After the defeat he returned to Paris, where he entered the chamber of peers, and publicly contradicted the assertion of Davout, the minister of war, that 60,000 men had arrived under the walls of Guise, declaring in plain terms that all was lost. Ney left Paris on the day the allies entered. Having failed to enter Switzerland, which was guarded by the Austrians, he remained some time in concealment in the provinces, but was finally arrested and brought to Paris. He was tried by the chamber of peers and sentenced to death (4th December). The sentence was executed on 7th December, 1815.

NGAMI, a lake of South Africa, on the north frontier of the Kalahari Desert. It lies at the height of 3700 feet above sea level, and is of somewhat irregular shape, narrow towards the centre, and thence bulging out on both sides, so as to form two nearly equal ovals; the one terminating at its west, and the other at its east extremity. Its greatest length is 37 miles; its breadth near the centre, where narrowest, does not exceed 4 miles, but towards the west, where widest, about 12 miles; the whole area is about 298 square miles. The north shore is low and sandy. The south shore is so closely fringed along the water line by belts of reeds and rushes as to be accessible only in a few places, or where the native cattle or other animals have broken through. The greatest depth of water is towards the east extremity; in other directions, and especially on the west, it is shallow. The principal, and indeed the only known feeder of the lake is the Teoge, which enters it near its north-west extremity, and though not more than 40 yards wide is deep, and when in flood discharges a large volume of water. Its outlet is the Zouga, which issues from its east extremity. The first Europeans who visited it were Dr. Livingstone and Mr. Oswell in 1849.

NIAGARA, a river of North America, separating Ontario or Upper Canada from the state of New York, and conveying the waters of Lake Erie into Lake Ontario. It is 33½ miles long, and varies in breadth from 1 to 4 miles, being about the former where it issues from Lake Erie; total descent, 331 feet. It is occasionally interspersed with low wooded islands, the largest of which, Grand Island, has an area of 17,000 acres. About 15 miles from Lake Erie it is precipitated over a ledge of rock, and forms the celebrated Falls of Niagara, having been previously divided into two cataracts by a central island, called Goat Island. It discharges, it is computed, 100,000,000 tons of water each hour. The cataract on the south side of the island, called the American Fall, is 162 feet high, width 1125 feet; that on the Canadian side, called the Great or Horse-shoe Fall, is 149 feet high, width 2100 feet. A little above the American Fall Goat Island is connected by a bridge with the American side. Below the falls the river rushes with great velocity down the sloping bottom

of a narrow chasm for a distance of 7 miles. This ravine has a general width of 200 to 400 yards from cliff to cliff, and its walls rise almost perpendicularly to a height of from 250 to 300 feet. At the lower extremity of the American Fall the river, there about 1200 feet wide, has so far resumed its tranquillity as to admit of the establishment of a regular ferry across. About three miles below the falls a wire suspension-bridge has been erected across the river; it is 800 feet in span, and 258 feet high. Railway trains pass over the bridge, and there is also a roadway for carriages and foot passengers.

NIAM NIAM, a negro race inhabiting a district of North Central Africa extending from 29° to 24° E. lon., and probably further to the west; and from about 4° to 6° N. lat. It is bounded on the north by the territory of the Bongo, east by that of the Mittu, south by the Monbutu, and west by unknown tribes. Petherick was the first European who reached this territory, which he visited in 1858, and together with the brothers Poncet the first who sent intelligence of the people to Europe. Piaggia and Von Heuglin subsequently visited them, the former in 1863; and finally Schweinfurth travelled through the country to the Monbutu Kingdom on his Central African journey in 1870. The section examined by Schweinfurth showed a gradual sinking to the north and west, broken by isolated blocks of granite reaching 1000 feet in height, and by some slight undulations, so that the prevailing direction of the rivers is north-westerly. The numerous streams divide the land into park-like sections, which are generally covered with grass and stunted shrubs except along the water-courses, which are overhung by thick woods reaching an average height of 80 to 100 feet, in which masses of creeping plants bind the branches of the trees, and a tangled brushwood covers the ground, while over all reigns the atmosphere of a hot-house. Among cultivated plants may be mentioned the *Eleusine Corocana*, which is used for making bread, and also for brewing a very palatable beer. Maize, durra, cassava, and yams are also cultivated. Watermelons, pumpkins, and cucumbers are likewise among the products of the country. The only domestic animals are dogs and poultry. Cattle are entirely wanting. Wild animals for the chase are numerous. The chief among these is the elephant, which is more frequently met with than in the northern and eastern negro kingdoms, where it is nearly extirpated. The stations of the Arab ivory and slave dealers are approaching nearer and nearer to this region. The Niam Niam prefer human flesh to all others, and contrive to provide themselves with it in their marauding expeditions, like their neighbours the Monbutu. They are distinguished by this love of human flesh from the much ruder negro races of the north, the Dinka, Djur, Bongo, and Mittu, by whom they are on this account held in contempt. The Soudan-Arab word Niam Niam originally signifies flesh-eaters, or rather human flesh-eaters. The Niam Niam are of a compact and powerful build, with long nose, small mouth, and broad lips. They are distinguished from the neighbouring negro tribes of the north and east by their strong close beards and long hair, which they part and carefully bind into plaits, knots, and chignons, and by their reddish-brown or copper-coloured skin. Apparently at a comparatively recent period this hunting and agricultural people have wandered from the west to their present habitation, and have become masters of the country. Their chiefs, of whom there are about a hundred, rule independently over a wide extent of country, and, together with their warlike retainers, form exclusively the noble and proprietary class, while the neighbouring tribes are treated as villeins. The chiefs rule over their subjects with absolute authority, and execute the punishment of death with their own hands. Their straw-built huts are perfectly conical in form. Man and wife live in huts separate from each other. In each establishment there is, besides, a common apartment or divan, in which public affairs are discussed, and where the children live from the age of eight until they acquire an establishment of their own. The Niam Niam show great aptitude in their clay and iron works, especially in forging their weapons, and in smelting their metals they use an ingeniously-devised bellows.

NIAS, a large island off the south-west coast of Sumatra, from which it is separated by a strait 60 miles wide. It is about 50 miles in length, and 20 miles average breadth. Its inhabitants are numerous, industrious, and frugal, expert handicraftsmen, temperate and regular in their habits, but at the same time avaricious, vindictive, and sanguinary. Numbers of hogs are reared on the island, and some parts of Sumatra are supplied from hence with yams, beans, and poultry. Rice also is grown extensively, but chiefly for exportation. It belongs to the Dutch, by whom it was taken possession of in 1857.

NIBBY, Antonio, an Italian antiquarian, born at Rome in 1792; died in 1839. From the age of sixteen he exerted himself to found the Hellenic Society, which afterwards received the name of the Academy of the Tiber. In 1812 he was employed in the library of the Vatican, in 1814 as secretary to Louis Bonaparte, and was subsequently professor of archæology in the great college of Rome and in the school of France. His principal works are La Grecia di Pausania (Rome, 1817–18); Sul Foro Romano, la Via Sacra, &c. (Rome, 1819); Viaggio Antiquario ne' Contorni di Roma (Rome, 1819); Elementi di Archæologia (Rome, 1828); Viaggio Antiquario ad Ostia (Rome, 1829); Album di Roma (Rome, 1834).

NIBELUNGENLIED (Song of the Nibelungen), or Nibelungen Noth (Nibelungen's Need), an ancient German epic, ranking among the noblest works of imagination. The name *Nibelungen'lied* is derived from *Nibelungen*, or *Niflungen*, an ancient and powerful Burgundian tribe, who were themselves so called because the hero Siegfried had brought to Burgundy the immense treasures which he had taken from the Nibelungen, a fabulous royal race of the North. The name is probably connected with *Nebel*, mist. The subject of this great epic is the dreadful fate of the Burgundians, caused by the passion of two princely pairs. The one pair are Siegfried, son of King Sigismund of Santen on the Rhine, and Chriemhild, sister to Gunther, king of Burgundy; the other are Gunther and Brunhild, a heroine of the fabulous North. Siegfried—as noble a hero as ever was depicted—is beloved by Chriemhild. Her brother Gunther is enamoured of Brunhild of Iceland. But the northern princess can only be won by force. A successful suitor must conquer her in combat. Gunther promises Siegfried his sister's hand if he will aid him in gaining Brunhild. Siegfried, by means of a cloak which renders him invisible, is enabled to assist Gunther in his encounter with Brunhild, whom he vanquishes and marries. On the night of her nuptials, however, Brunhild has another struggle with Gunther, in which she overcomes him. Siegfried a second time reduces her to submission, and takes from her her girdle and ring, in which lay her power. These he gives to Chriemhild, who, after an interval of ten years, in a quarrel with Brunhild, shows her those trophies of her defeat. Brunhild resolves on vengeance, and persuades Hagen of Tronege to murder Siegfried, which he effects with the privity of Gunther. Chriemhild, after thirteen years passed in widowhood, in pursuance of a project of vengeance

marries the heathen Etzel (Attila, king of the Huns, a mythological personage who appears in various stories under several modifications). After another interval of thirteen years, in which Chriemhild gives a son to Etzel, she invites the Burgundians or Nibelungen to the court of Etzel, involves them in strife with the Huns, and after several bloody battles both parties are destroyed. Gunther and Hagen, the sole survivors, surrender to Dietrich of Bern, an ally of Etzel, who delivers them to Chriemhild, with an injunction to spare their lives. She puts them both to death, and she in turn is killed by a vassal of Dietrich. The poem thus ends in a terrible scene of fire and bloodshed. The time in which we find the historical basis of this tragedy is about 430 or 440 A.D.; the scene is on the Rhine, and on the frontiers of Austria and Hungary. The story of the Nibelungenlied belongs to the general body of Germanic and Scandinavian mythology, and it may be traced in the myths of others of the Aryan nations. It is essentially the same tale as that of the Volsunga Saga (with its hero Sigurdr), afterwards expanded in the Edda; and the hero Siegfried plays a prominent part in the Heldenbuch, and in other legendary productions. The author of the poem is not known for certain. Some have attributed it to Henry of Ofterdingen or to Klingsohr of Hungary, but recent investigations make it probable that an Austrian knight was the author (about 1140). The poem does not appear to have been so popular as some others, and after the sixteenth century it fell into oblivion, so remaining until 1751, when some considerable portions of it were published by Bodmer. Lachmann, in his edition of 1826, first made it the subject of scientific criticism; but his views have not been sustained by later critics. The St. Gall text, which he regarded as a later redaction, is now considered the best, and the Nibelungenlied is regarded not as a compilation, but as an organic whole, composed by one author, who derived his materials from the rich stores of song and legend which were the common possession of the German people. Among the best editions is that of Karl Bartsch in the series of Deutsche Classiker des Mittelalters. It is based on the St. Gall text. Most MSS. and editions of the Nibelungenlied contain also the Klage or Lament, a kind of supplement to it describing the burial of the warriors that fell at Etzel's court, and the carrying of the tidings to their native country. It was composed about 1170, and is the work of a different author. The Nibelungenlied has been translated into modern German by Simrock (sixteenth edition, 1865), Bartsch (1867), &c.; there are English translations by Birch and Lettsom.

German critics speak highly of the Nibelungenlied, and prefer it in many respects to the Iliad. The language of the Iliad is, they admit, superior to that of the Nibelungenlied both as to the idiom itself and the mastership with which the Greek poet wields it, though the German epic has a childlike and venerable simplicity. On the other hand, they argue that the plan of the latter is vastly superior to that of the former. It is a great plan, from beginning to end, and embraces a whole event; the Iliad but a part of an event. The difference, too, between the chief heroes of the two poems is striking. Achilles is a grand, but a wilful and violent character, whilst Siegfried is noble in action, pure in soul, and full of love. In both poems the chief hero appears but for a short time. The Iliad does not bring him prominently forward till late in the action, while the Nibelungenlied soon removes him from the stage; yet in both poems the whole action turns upon this individual. In the former the world of gods is an essential element of the whole poem; in the latter, this element is entirely wanting. The origin of the whole catastrophe in both poems is love; but what a difference is there in the love depicted, and the use made of it, in the two poems! The lover in the Iliad appears like a boy, who is very properly scolded for his impetuosity by his relations. The love of Siegfried is of the noblest kind—the love of a hero. In the Iliad love soon ceases to be the prominent agent; in the Nibelungenlied it is throughout the source of the action. The Iliad ends early, and does not even carry us to the death of Achilles, which the poem predicts, in so many passages, as near; nay, for which it prepares us in that charming passage in which Patroclus requests his friend to let the ashes of both repose in the same urn. The poet seems to be afraid of becoming too tragical. The Nibelungenlied exterminates a whole tribe, leaving only a few to mourn the tragic end; and what a scene of mourning! how simple and solemn! After having read it through you feel for a moment inclined to ask, Why did the world continue to roll on? Such a tragic picture of life leaves a different impression from the Greek poet's dark views of human destiny, as shown, for instance, in Ulysses' visit to the departed. Carlyle, in his essay on the Nibelungenlied (Miscellaneous Essays, vol. ii.), also compares the two poets, considerably to the disadvantage of the German singer. 'The singer of the Nibelungen,' he says, 'is a far different person from Homer; far inferior both in culture and in genius. Nothing of the glowing imagery, of the fierce bursting energy, of the mingled fire and gloom that dwell in the old Greek makes its appearance here. The German Singer is comparatively a simple nature; has never penetrated deep into life; never questioned Fate, or struggled with fearful mysteries; of all which we find traces in Homer, still more in Shakspeare; but with meek believing submission has taken the Universe as he found it represented to him; and rejoices with a fine childlike gladness in the mere outward shows of things. He has little power of delineating character; perhaps he had no decisive vision thereof. His persons are superficially distinguished, and not altogether without generic difference; but the portraiture is imperfectly brought out; there lay no true living original within him. He has little Fancy; we find scarcely one or two similitudes in his whole Poem; and these one or two, which moreover are repeated, betoken no special faculty that way. . . . His are humble wood-notes wild; no nightingale's, but yet a sweet sky-hidden lark's. In all the rhetorical gifts, to say nothing of rhetorical attainments, we should pronounce him even poor. Nevertheless a noble soul he must have been, and furnished with far more essential requisites for Poetry than these are; namely, with the heart and feeling of a Poet. Everywhere he shows a noble Sensibility: the sad accents of parting friends, the lamentings of women, the high daring of men—all that is worthy and lovely prolongs itself in melodious echoes through his heart. A true old Singer, and taught of Nature herself!'

NICÆA (Nice), a celebrated ancient city of Asia Minor, capital of Bithynia, situated on the eastern shore of Lake Ascania or Ascanius, in a wide and fertile plain. It was formerly called Antigoneia, after Antigonus, general of Alexander the Great, who rebuilt the town on the site of an older city. The name was afterwards changed to Nicæa, in honour of his wife, by Lysimachus, who had made himself master of a great part of Asia Minor. Subsequently to this it rose to great importance, and became a favourite residence of the kings of Bithynia. Under the Roman Empire it retained long an exalted rank among the eastern cities, and is renowned in ecclesiastical history for the famous council held here in the reign of Constantine (A.D. 325), in which

the formula bearing the name of the Nicene Creed was drawn up. (See NICE—COUNCIL OF.) Nicæa was overthrown by an earthquake in the year of the great council, and restored by Valens in 368. Nicæa, which long served as the bulwark of Christendom against the Turks, was taken by them in 1078. It was recovered by the Crusaders in 1097. After the foundation of the Latin Empire in Constantinople in 1204 the Greek Emperor Theodorus Lascaris made Nicæa the capital of his empire, which it continued to be until in 1261 the Greek emperors recovered Constantinople. It was finally taken by the Turks in 1330. The modern town of Isnik now occupies the site of Nicæa, and is a miserable place of about 100 houses. The ancient walls are still in good preservation, and many other remains still exist to testify to its former importance.

NICANDER, a learned Greek physician and poet, a native of Claros, near Colophon, in Ionia, where he succeeded his father as priest of Apollo. He flourished about 185–135 B.C. Two of his poems are extant—Theriaca, upon poisonous animals and the remedies against their bite; and Alexipharmaca, upon antidotes in general. Both are important in natural history. The best editions are those of Gorræus (Paris, 1557, 4to), of Salvinus (Florence, 1764), and of J. G. Schneider (Halle, 1792).

NICARAGUA, a republic of Central America, extending from the Pacific Ocean to the Caribbean Sea, and having on the north and north-east the state of Honduras, and on the south Costa Rica; area, about 58,000 square miles. A range of hills runs along its western coast at the distance of a few miles from the sea, attaining no great height until they approach the confines of Costa Rica, where they rise to an elevation of from 5000 to 11,000 feet. Between this ridge and the Lakes of Nicaragua and Leon the land is moderately level, but along the borders of Honduras and San Salvador lofty ridges again occur, running in various directions. The central part of the state is occupied by a vast plain known as the plain of Nicaragua, comprising the lake of the same name. There are several volcanoes in the state, all towards the sea, standing alone or but slightly connected with the main ridge, but none of them are of any great elevation, the highest probably not much exceeding 5000 feet. Nicaragua has a considerable number of rivers, but none except the San Juan is navigable in a commercial sense, nor otherwise much known. The lakes are Nicaragua and Leon or Managua. Veins of silver and copper exist in many parts, but they remain almost all of them either unexplored or only superficially worked. Gold also is said to occur. The climate is on the whole healthy, though various. In the interior and mountainous parts the temperature is more dry and cool than on the coasts, where it is hot and somewhat humid. By far the greater portion of Nicaragua consists of plains and gentle slopes, formed of a rich black loam. Unfortunately, however, agriculture is at a very low ebb, and but a small portion of this valuable land is made available. The productions are indigo, sugar, coffee, cacao, and cotton, the last of superior quality, and formerly raised in large quantities, but now almost wholly neglected. Maize, rice, beans, and plantains, the staple food of the people, are raised in abundance and sold very cheap. Some wheat also is grown in the mountainous and cooler parts of the country. Fruits of various kinds are plentiful, including excellent oranges and lemons. One of the principal sources of wealth consists in cattle, of which there are great numbers in all parts, particularly in the districts on the east side of the lake, where extensive and excellent pasturage is met with. Leon, the former capital, is partly in ruins, and surrounded by active volcanoes. A provisional capital has been chosen at Managua, also on the slope of an active volcano. In 1821 Nicaragua joined the other four provinces of the captain-generalcy of Guatemala (Guatemala, Costa Rica, Honduras, and San Salvador) in revolting against Spain, and after a sanguinary civil war, which reached its climax in the streets of Leon, it achieved its independence. It first joined the Mexican Empire under Iturbide, but in 1824 united with the other provinces of the ex-Audiencia in forming the Republic of Central America. This union was dissolved in 1839; a new one, formed in 1842, with the exclusion of Costa Rica, lasted till 1845. Nicaragua then became an independent republic. In 1847 a dispute with Great Britain arose in reference to the boundaries of Nicaragua with the Mosquito State, which led to hostilities. The chief object of the British seems to have been to render free the port of San Juan del Norte, the only port held by Nicaragua on the Atlantic, and which the British maintained to be the property of the Mosquito Indians. Accordingly the dispute was settled in 1860 by a treaty which rendered this port a free one under the sovereignty of Nicaragua. In 1855 the government became divided, and a civil war ensued, the two seats of power being Leon and Granada. The Liberal party, which had its capital in Leon, called in the aid of an American filibuster named Walker, who was actually elected president in 1856; but after much anarchy and strife, was defeated and expelled in 1857. A new constitution was adopted on 19th August, 1858, but its violation by the re-election of Martinez to the presidency in 1862 led to another civil war. The constitution otherwise remains in force. The legislative power is vested in a Congress of two houses, the Senate and the House of Representatives, both elected by universal suffrage, the former for the term of six years, and the latter for the term of four. The Senate contains ten members, the House of Representatives eleven. The president is elected for four years, and exercises his functions through a council of four responsible ministers. The revenue of the republic for the year 1882 amounted to about £324,836; the expenditure to £312,932. There is a public debt of about £189,406. The state possesses an army of 703 men with a militia of 9600. The principal exports are caoutchouc, coffee, hides, yellow-wood, and indigo. The imports in 1882 were estimated at £352,043, and the exports at £419,702. The population, which consists in great part of Indians and half-castes, was officially stated in 1883 to be 275,815.

NICARAGUA, LAKE OF, an extensive sheet of water in Central America, in the state of same name, 90 miles long, north-west to south-east; greatest breadth, 40 miles; mean, 30 miles; 128 feet above the Pacific, from which it is separated by a line of active volcanoes. The river San Juan de Nicaragua flows from its south-eastern extremity into the Caribbean Sea, and at its north-western extremity it is connected with the smaller Lake of Managua or Leon by the river Penaloya. About 100 yards from the beach there is generally a depth of about 2 fathoms; in other parts all the intermediate soundings between 5 and 15 fathoms are found. Water-fowl and excellent fish are abundant; alligators also, of great size, are numerous. It contains some islands and several groups of islets, all of volcanic origin, of which one, Zatapera, rises to a height of 2000 feet; another, Madera, to 4000 feet. Some of the islands are inhabited. On one of the smaller islands, Pensacola, numerous relics of antiquity have been found, consisting of huge elaborately-sculptured stones, massive idols, and figures of monstrous animals. The material is in every case black basalt, and the cutting

exhibits great freedom and skill, in workmanship and style differing materially from those of Yucatan. In June, 1883, the island of Ometepec was utterly devastated by a volcanic outbreak, causing an overflow of lava streams, which filled up the valleys and engulfed farmsteads, cattle, and all the cultivated fields. Steamers now ply on the lake, which forms a link in one of the routes across the great isthmus of Central America.

NICARAGUA WOOD, a kind of dye-wood of a bright red colour, brought from the state of Nicaragua, is thought to be a species of *Cæsalpinia*, and resembles Brazil wood in its properties, but yields a smaller amount of colouring matter.

NICCOLINI, Giovanni Battista, an eminent tragic poet, was born on 31st December, 1785, at the baths of San Giuliano, a small village in the neighbourhood of Pisa, where his father held an office under government. He studied at the University of Pisa, and in 1804 made his first appearance as an author by the publication of La Pietà, a poem commemorative of the exertions of the fraternity of La Misericordia during the pestilence and inundations which devastated Leghorn in the beginning of the present century. In 1807 he was made librarian and professor of history and mythology in the academy of fine arts in Florence, and in 1810 produced Pollissena, his first tragedy, written for the prize offered by the Tuscan Academy. Other tragedies—Ino e Temista, Edipo, Agamemnone, Medea, and Nabucco—followed, and obtained distinguished success, the play of Nabucco especially causing at the time a great sensation from a fancied resemblance in the incidents to the closing scenes of Napoleon's career. A still greater reputation was achieved by Antonio Foscarini, Giovanni da Procida, Filippo Strozzi, and Arnoldo da Brescia, which procured for their author a European fame. Niccolini as a tragedian was a follower of Manzoni, to whom, however, he is said to have been much inferior. As a patriot no one had the cause of Italian freedom and independence more at heart, and he had the satisfaction before he died of witnessing its accomplishment. The aspirations expressed in some of his tragedies exposed them to government censure and interdiction, Arnoldo da Brescia, which has been translated into English, being more especially laid under the official ban. He died at Florence on 20th September, 1861, and was interred in the church of Santa Croce, whither an immense multitude followed him to his grave. For some years previous to his death he had been engaged on a history of Swabia, but his life came to a close without any part of it being published.

NICE (Italian, *Nizza;* ancient, *Nicæa*), a city and seaport of France, capital of the department of the Alpes Maritimes, beautifully situated near the base of the Maritime Alps, and on both sides of the Paglion, a mountain torrent of short and rapid course. It is divided into the Old, on the left bank of the Paglion, and New Town, on the right. Both quarters, but more especially the New Town, have of late years been much extended. The streets of the former are mean-looking compared with those of the latter, in which there are many large hotels and lofty and handsome houses. The quays that border the river are filled with gay shops, and a broad space formed by covering over the Paglion is adorned by a statue of Masséna in bronze, erected in 1867. There are two noble squares, one of them surrounded with arcades, and adjacent to the other on the sea-side is a raised terrace with gardens, which affords a delightful promenade. There are no remarkable public buildings in the city. Nice possesses some silk, cotton, and paper mills; many oil-mills, and small manufactories of tobacco, leather, soap, and paper; liqueurs, essences, and perfumery are also made. The harbour or port is separated in great measure from the rest of the town by the hill on which the castle stood. It lies ¾ mile east of the Paglion, and is small and open to the south-east. Between the piers are only 15 feet of water, and the anchorage before the town is unsafe. The exports consist principally of oil, wine, and silk, with essences, perfumes, &c. Nice is much resorted to in winter by foreigners, particularly English, whose numbers have been estimated at 5000 to 6000, besides French, Germans, Russians, and Poles, and for whom ample accommodation is provided. Provisions are moderate, and vegetables of various kinds abundant, but the water is indifferent. Though Nice is doubtless a very pleasant retreat, its climate, owing to sudden changes of temperature, is ascertained to be very unsuitable for those labouring under pulmonary and bronchial complaints. Nice belonged to Italy previous to 1860. Pop. (1881), 66,279.

NICE, Councils of. Ecclesiastical councils were held at Nicæa, in Nicomedia, in 325, 326, and 787; the first and last are called the first and seventh œcumenical councils. Of the method of summoning the first œcumenical council Gibbon says, 'The archbishop or metropolitan was empowered by the laws to summon the suffragan bishops of his province, to revise their conduct, to vindicate their rights, to declare their faith, and to examine the merit of the candidates who were elected by the clergy and people to supply the vacancies of the episcopal college. The primates of Rome, Alexandria, Antioch, Carthage, and afterwards Constantinople, who exercised a more ample jurisdiction, convened the numerous assembly of their dependent bishops. But the convocation of great and extraordinary synods was the prerogative of the emperor alone.' Constantine had already, before he became an open proselyte to Christianity, convened a council at Arles (A.D. 314). The object of the Council of Nice, which was likewise convened by him, was to settle the controversies which had arisen in regard to the doctrine of the Trinity. The bishops who attended the council are variously estimated by different authorities: Gibbon gives 318; Eusebius, 250; other early authorities, 300 and 320. The Eastern bishops attended in person; the Western Church was represented by the legates of the Roman pontiff. The number of ecclesiastics of all kinds who assembled on the occasion was over 2000. The session lasted about two months. It was frequently attended by the emperor in person. According to some accounts the earlier sittings were of a very stormy kind, and Constantine had to use much address to reconcile the disputants. He employed, it is said, sophists or advocates to represent the doctrine he supported in the most attractive terms, and this, it is added, was rendered necessary by the ignorance and simplicity of the fathers. The creed adopted by the council was completed by the Council of Constantinople in 381, and in its later form it is generally known as the Nicene Creed. (See Creed.) This creed in its earlier form was, it appears, presented to the council by Eusebius as the Creed of Cæsarea, of which he was bishop. It was adopted with the addition of a single word, *homoousion* (consubstantial), which was used to represent the relation of the Son to the Father. This word had a previous ecclesiastical history. Its insertion in the creed is generally stated to have been suggested by Athanasius. According to Gibbon it was Eusebius of Nicomedia, one of the leading Arians, who himself suggested it in a letter in which he declared it inadmissible, whereon the council eagerly adopted it as distinguishing their rejection of the Arian doctrine. He also says that this word

united against the Arians the Sabellians, whose use of it had been condemned by the Council of Antioch fifty years previously, and the orthodox party, headed by Athanasius and Gregory of Nazianzen, who were reconciled to it by the repugnance of the Arians. Eusebius and Athanasius assert that the word had been used in the orthodox sense by Dionysius of Alexandria and by Origen. In a subsequent council assembled at Seleucia a party of the Arians adopted as an approximation to it the word *homoiousion* (of a substance similar to). Besides the formulation of their creed, the council regulated some matters relating to discipline. They determined the time for the keeping of Easter (see EASTER), rejected the dogma of the celibacy of the clergy, and allowed the ordination of deaconess.

The Nicene Creed was first embodied in the liturgy of the church by Timothy, patriarch of Constantinople, in 471. It was also ordered to be chanted for the edification of the people in the churches of Spain by the Council of Toledo in 589. This council added the word *filioque*, to indicate the procession of the Holy Ghost from the Father and the Son, which occasioned a schism between the eastern and western churches. The Gallican Church soon after adopted the creed into the liturgy, and in 1014 it was received into the Ordo Romanus.

In 326 some bishops assembled again at Nicæa to depose Eusebius of Nicomedia and Theognis of Nicæa, who were both suspected of continued adherence to Arianism. Constantine expelled these two bishops to Gaul, but in two years both were restored to their sees.

The seventh œcumenical council was assembled by the Empress Irene, with the concurrence of the pope, in order to establish the worship of images. It decreed that images were to be used as aids to devotion, and assigned to them an honorary adoration, but not the worship of *latria*, which belongs to God alone.

NICHE (Italian, *nicchia*, a shell), a cavity or hollow place in the thickness of a wall, to place a figure or statue in. Niches are made of all segments under a semicircle; they are sometimes also square. Care must be taken to proportion the niches to the figures, and the pedestals of the figures to the niches.

NICHOL, JOHN PRINGLE, LL.D., an eminent astronomer and author, was born on 13th January, 1804, in the town of Brechin, Forfarshire, and originally educated for the Scottish Church, of which he became a licentiate. He did not, however, obtain much success as a preacher, and turned his attention to astronomy, by his lectures and essays on which he acquired so much reputation, that in 1836 he was appointed professor of astronomy in Glasgow University. He retained this important office with great credit till his death, which took place at Glenburn House, Rothesay, on 19th September, 1859. Among Dr. Nichol's literary works may be mentioned The Architecture of the Heavens (1838); Contemplations on the Solar System (1838); the Planet Neptune, an Exposition and History (1848); The Stellar Universe (1848); and the Planetary System (1851). All of these, though somewhat deficient in solidity, have at least the merit of being written in a very attractive and interesting style, and obtained a wide popularity. He likewise edited a Cyclopædia of Physical Sciences, published in 1857. The same characteristics belonged to the lectures on astronomy which he delivered on various occasions, with great success, in most of the principal towns of Great Britain.

NICHOLAS, the name of six Roman pontiffs.—NICHOLAS I. (858–867), called *Saint Nicholas*, a Roman by birth, was the greatest and most powerful pope from the time of Gregory I. He issued decrees which the sovereign princes of Europe found themselves constrained to obey. He compelled Lothaire, king of Lorraine, to take back his wife Theutberga, whom he had divorced. He excommunicated Photius, patriarch of Constantinople, and thus caused an open breach between the Eastern and Western Churches. (See GREEK CHURCH.) He also compelled Hincmar, archbishop of Rheims, who, with the support of Charles the Bald, endeavoured to maintain the liberty of the Gallican Church against him, to submit to his authority. He sanctioned the spurious decrees of Isidore.—NICHOLAS II. (1058–61), a Savoyard whose original name was Girard de Bourgogne. The anti-pope Benedict X. was elected by an armed faction previous to Nicholas, but was immediately deposed on the election of Nicholas by a council assembled by the latter. Nicholas summoned a second council at Rome to regulate the future election of the pontiffs. The choice was given first to the cardinal bishops, to be afterwards confirmed by the cardinal clerks, and then referred to the lower clergy and people. The confirmation of the emperor was also needed to complete the election. This reform, the initiation of the college of cardinals, was the work of Hildebrand (Gregory VII.), by whom this pope was governed. By acknowledging Robert de Guiscard as duke of Calabria Nicholas first established the claim of the popes to the superiority of the Kingdom of Naples.—NICHOLAS III. (1277–80) (Giovanni Gaetani Orsini) was much given to nepotism, and especially jealous of the temporal rights of the Holy See. He obtained from Rudolph of Hapsburg the restitution of the towns of the Romagna in consideration of releasing him from a vow to go to the Holy Land. He avenged himself on Charles of Anjou, who had refused his alliance, by compelling him to renounce the vicariate of the empire, and by entering into a league with Pedro III. of Arragon, by whom Charles was soon after deprived of Sicily. (See SICILIAN VESPERS.) Nicholas failed in a negotiation with the Emperor Michael Palæologus for the re-union of the Greek and Latin Churches.—NICHOLAS IV. (1288–92). His attention was mainly occupied with the successive losses sustained by the Christians established in Palestine, but his efforts to excite a new crusade entirely failed, and on his death the project was finally abandoned.—NICHOLAS V. (anti-pope) was crowned by Louis of Bavaria in 1328, submitted to Pope John XXII. in 1329, and afterwards died in prison.—NICHOLAS V. (Tommaso da Sarzano), 1447–55. At the time of his election there was an anti-pope, Felix V., but in 1449 he procured his submission. The new pope, who was distinguished for his learning, immediately on his accession commenced the formation of the Vatican Library. He continued during his pontificate an enthusiastic patron of literature, a collector of original manuscripts, and of fine editions of books. In 1448 he approved of the concordat which Frederick III. afterwards got accepted by the Diet of Aschaffenburg, and in 1452 crowned that emperor at Rome.

NICHOLAS I. (NIKOLAI PAVLOVICH), Emperor of Russia, third son of the Emperor Paul I., was born 7th July, 1796. His education was conducted under the care of his mother, Sophia Dorothea, daughter of the Duke of Würtemburg. He learned to speak French and German with facility, and acquired considerable taste for military exercises. During the reign of his brother Alexander he lived mostly in retirement, but accompanied Alexander to Paris in 1815. He afterwards visited England and Germany, and the provinces of the Russian Empire. On 13th July, 1817, he married Charlotte, eldest daughter of Frederick William III., of Prussia. Alexander I.

died without issue on 1st December, 1825. The surviving elder brother of Nicholas, the Grand-duke Constantine, had already renounced his pretensions to the crown, but Nicholas waited a confirmation of his renunciation before claiming it. This being received, he accepted, on 24th December, the oaths of fidelity from the great bodies of the state. The troops were assembled to take the oath on the 26th. On this occasion a preconcerted conspiracy exploded. Some of the officers stepped from the ranks and induced the soldiers to cry out for Constantine and Constitution. Miloradovich, governor of St. Petersburg, fell in an attempt to suppress the revolt. Nicholas then stepped boldly to the front, and commanded the mutineers to return to the ranks and kneel down. Those whom he addressed were overawed by his tall and commanding appearance (he was 6 feet high, and reputed one of the handsomest men in Europe), and obeyed his summons; but the revolt was only finally suppressed by the use of artillery. Inflexible vengeance was executed on the mutineers, the law which had abolished the punishment of death being set aside to increase the rigour of their punishment. Five were hanged, and numbers transported to Siberia, and for long afterwards those of them who could be traced were dealt with with equal severity. Such was the commencement of a reign distinguished for administrative vigour, and for the rigour of its domestic despotism hardly equalled in the annals of modern Europe. The home and foreign policy of Nicholas, indeed, were essentially one, and both were actuated by the same spirit. At home his great aim was to weld the peoples of Russia into a single homogeneous people. This idea was pursued in a semi-religious spirit. It was the Holy Russian Empire that Nicholas aspired to build up. All means for this purpose were sacred, and a chief part was played by the organization of military force. Nicholas regarded himself as the chief representative in Europe of the divine right of monarchs. At the accession of Nicholas Russia was at peace with all other powers. The Treaty of Akermann concluded with Turkey in 1826, placed Moldavia, Walachia, and Servia under her protection. A war with Persia broke out soon afterwards, which lasted for more than a year, in 1827–28, and was concluded by the Peace of Turkmanchai, by which Persia ceded to Russia the province of Erivan, and considerable territory on the lower course of the Aras. Nicholas also joined in the Treaty of London, 6th July, 1827, by which the independence of Greece was established, and his fleet joined with the fleets of England and France in destroying the fleets of Turkey and Egypt at Navarino, 20th October, 1827. This affair led to a war between Russia and Turkey, the latter power showing its discontent by refusing to execute the Treaty of Akermann. The western powers, whose policy had been temporarily altered by their sympathy with Greece, did not interfere. Nicholas himself assisted at the siege of Varna. Peace was concluded 14th September, 1829, at Adrianople, Turkey paying an indemnity, and ceding the fortress and pashalik of Anapa. An insurrection of the Poles broke out on 29th November, 1830, and was terminated by the entrance of the Russians into Warsaw, 8th September, 1831. This event gave occasion to a very strong manifestation of the despotic policy of the emperor. The rebels were punished with the relentless and cold-blooded severity of which he had already given proof. The number of victims was increased by the base policy of Austria and Prussia, who drove across the frontier those who had taken refuge in their territories. Besides those executed, numbers perished under the knout, others were sent to Siberia or to work as convicts in the navy. The language of Poland was officially suppressed, the inhabitants in great numbers were deported, Russian officials were put in every kind of public employment, and every attempt made to extinguish by force the remains of Polish nationality. To foreign powers, scandalized at the violence of these measures, it was intimated that Russia regarded Polish affairs as matters exclusively of domestic administration. When the power of Mehemet Ali threatened the Porte, Russia, along with other European powers, interposed in favour of Turkey. A treaty of mutual alliance was thus concluded between Russia and Turkey, 8th July, 1833. In this treaty Turkey engaged to close the Dardanelles against other powers. In the East, Persia, now under the influence of Russia, was stimulated to an expedition against Herat, and Russia herself pushed her conquests in the East, particularly in the expedition against Khiva (1839), in a manner which excited the utmost jealousy of England. In his internal administration Nicholas pursued the idea of unification with an unsparing zeal which involved many of his native subjects in sufferings similar to those of the Poles. The Roman Catholics, the schismatic Greeks, and the Protestants were persecuted in turn in the interest of uniformity of religion. Schools and monasteries were suppressed, soldiers were quartered upon the recalcitrant, who were given up to their brutalities, and as the result of this coercion more than 800 Catholic parishes were in the course of a few years proclaimed orthodox. As an instance of the measures adopted a ukase of 2d January, 1839, offered a free pardon to any Catholic condemned to the galleys for murder, theft, or any other crime, on his joining the Greek communion. At the same time, in the well-founded anticipation of a war in the East, military organization was pushed with similar energy. On the other hand, the consolidation of the laws and the amelioration of the condition of the serfs, with a view to their emancipation, were among the better projects of the emperor. A ukase to the latter effect was issued on 14th April, 1842, and the codification of the law, which occupied the greater part of the reign of Nicholas, was completed in 1846. The revolution of 1848 made the Russian government still more conservative. A system of police and espionage was adopted to keep out western ideas, and in 1849 the emperor gave the full support of his military power to Austria, to assist in suppressing the insurrection in Hungary, a measure to which he was the more easily incited by the circumstances that numerous Poles were fighting in the Hungarian ranks. Nicholas afforded a very reluctant recognition both to Louis Philippe and to Louis Napoleon, when the latter assumed the imperial title. He supported the claims of Denmark against Prussia in the Schleswig-Holstein difficulty. Early in 1852 began the difficulties about the custody of the holy places in Palestine, which, suspected by the western powers of covering more ambitious objects, led to the union of France and England against Russia, and to the Crimean war. (See CRIMEA.) Nicholas did not survive to see its termination. He is said to have taken the ill-fortune of his troops so seriously to heart as to cause his death. He appears, however, to have died of a lung disease, aggravated by a rash exposure, which he insisted, contrary to the advice of his physicians, in incurring in order to inspect a body of troops on the point of setting out for the Crimea. He met his end with fortitude, expressing to his son Alexander his regret that he could not leave him a peaceable and flourishing empire, as it had been his constant endeavour to do, and declaring that after Russia, it was he whom he had loved most in the world. He died at St. Petersburg, 2d March, 1855.

NICHOLAS, Sr., Bishop of Myra, in Lycia, is believed to have lived under Diocletian and Constantine, and to have suffered persecution under the former, but little is known of his life. He is the patron saint of Russia. He is also the patron saint of children, and tradition attributes miracles to him, among others the resurrection of three children.

NICHOLLS, Mrs. See Bronte (Charlotte).

NICHOLSON, John, brigadier-general, distinguished for his exertions in the suppression of the Indian mutiny, was born on 11th December, 1822. He was the nephew of a director of the East India Company, into the service of which he entered in 1839 as a cadet, and in 1841 became ensign of the 21st Native Bengal Infantry. In 1840 he was sent with his regiment to Ghazna, where, two years afterward, it surrendered to the Afghans, and he remained a prisoner till the defeat of Akbar Khan. He became lieutenant in 1842, and captain in 1845. During the Sikh war he served in the commissariat department, and was afterwards appointed assistant to the resident at Lahore. In the second Sikh war he took an active and distinguished part, rendering important services in the preliminary operations, and being present at the principal battles. He now became deputy-commissioner of the Lahore Board, under Sir Henry Lawrence, with the rank of colonel. In 1850 he visited England on family affairs. On his return he resumed his duties as a deputy-commissioner, and was remarkably successful in reducing the lawless border tribes under discipline. On the outbreak of the mutiny his services on the western frontier in maintaining the allegiance of the Panjab and in raising new levies became of the highest value. When the movable column raised in the Panjab was ready to march on Delhi, he assumed its command, and arrived there on 14th August, 1857, with 4200 men, nearly doubling the effective force of the assailants. On the 24th he defeated a large body of rebels who had attempted to get into the rear of the British at Nujufghur, 13 miles southwest of Delhi. In the assault of Delhi (14th September), according to General Wilson's report, 'he swept the ramparts from the Cashmere to the Cabul gates, occupying bastions and defences, capturing guns, and driving the enemy before him.' Here he received his mortal wound, and death ensued on the 23d September. Nicholson was a man of great physical strength, and as an instance of the exertions he underwent it is mentioned by an officer who served under him that on one occasion he was twenty-six hours in the saddle.

NICHOL'S PRISM, a simple and very effective polarizer of light, which is also employed to analyze polarized light. It is named after the inventor. A rhomb of Iceland-spar is carefully cut along a plane passing from the obtuse angle of one end at right angles to the plane containing the long diagonals of the two ends, the ends having first been cut to make angles of 68° with the obtuse edges of the prism (the natural angles are 71°). The cutting-plane is also perpendicular to the long diagonals of these cut ends. The two halves of the prism are now reunited in their former position by means of Canada balsam, whose index of refraction (1·549) is less than the 'ordinary' index (1·654) of Iceland-spar, and is greater than the 'extraordinary' index (1·483). A ray of common light passing into the rhomb at one end, becomes divided into two rays (called the ordinary and extraordinary rays), which are polarized in planes at right angles to one another. (See Polarized Light.) The ordinary ray undergoes total reflection at the layer of Canada balsam, and passes out at the side of the prism. The extraordinary ray does not undergo total reflection, and passes through alone. Light which has passed through a Nichol's prism is polarized in the plane perpendicular to that containing the short diagonals of the two ends. Planes parallel to the plane containing the short diagonals of the ends are called 'principal sections.' Two Nichol's prisms placed end to end appear perfectly opaque when their principal sections are at right angles to one another, perfectly transparent when the principal sections are parallel, and transmit light with diminished intensity in intermediate positions.

NICIAS, a wealthy and distinguished Athenian statesman and general, displayed much skill and activity in the time of the Peloponnesian war, after the death of Cleon, whose enemy he was. By his means the Athenians, after their defeat at Amphipolis, B.C. 423, concluded a fifteen years' peace with Sparta, which placed them, in regard to territory, in the same position in which they were before the war. This peace did not last long, however, and after a few years hostilities commenced anew. By the volatile Alcibiades the Athenians were induced to undertake a new expedition against Sicily, anticipating from it the conquest of the whole island. The more thoughtful Nicias at first opposed the scheme, but finding his warnings in vain gave in to it, and accepted the command of the fleet, along with Alcibiades and Lamachus. He afterwards, after the flight of Alcibiades, gained a victory under the walls of Syracuse, and was on the eve of receiving the surrender of the town when the Peloponnesian fleet hove in sight, defeated and hemmed in that of the Athenians, the most of whom, in attempting to pass through Sicily, were taken prisoners or slain. Nicias was among the latter. His life is given at some length by Plutarch.

NICKEL. In the copper mines of Germany the miners used to be much troubled with a mineral which seemed to contain copper, but which defied their utmost endeavours to obtain this metal from it. To this substance the miners gave the name of *Kupfer-nickel*, in allusion to a sprite or goblin who, under the name of Nickel or Nicholas, was supposed to haunt the mines, and to play all kinds of malicious tricks upon the miners, one of which was causing this worthless substance to assume the appearance of the valued copper. And when in after years a new metal was obtained from the kupfer-nickel, the name which the miners gave to the mineral was applied to the metal. The substance which so troubled the old German miners we now know contains no copper, but is a compound of nickel and arsenic; besides this substance the other principal ores of nickel are the diarsenide or *white nickel pyrites*, the arsenate or *nickel bloom*, the arsenio-sulphide or *nickel-glance*, the antimonio-sulphide or *Ullmanite*, the carbonate or *emerald-nickel*, and the silicate or *pimelite*. Metallic nickel is also prepared from a deposit called *speiss*, which forms in the pots in which smalt-blue is formed. (See Smalts.) This substance contains from 35 to 50 per cent. of nickel, besides cobalt, iron, copper, lead, arsenic, sulphur, and silica.

The processes by which the metal is obtained are generally long and complicated, the chief difficulty is to get rid of the cobalt; this may be effected either by precipitating the cobalt by means of potassium nitrite, or by treatment with barium carbonate after passing chlorine through the solution. When a pure solution of the metal has been obtained it is precipitated by a caustic alkali or alkaline carbonate; the ensuing precipitate is washed, dried, made into a paste with oil, and exposed, in a crucible lined with charcoal, to the heat of a blast-furnace, whereby metallic nickel is obtained as a fused mass, which may be fused into an ingot at the strongest heat of a forge fire.

Pure nickel is a silver-white, ductile, malleable metal, more fusible than iron; like iron it is capable of taking up small quantities of carbon to form a substance which is more fusible than the pure metal. This metal also resembles iron in being magnetic at ordinary temperatures; when heated to 250° it loses this power, but recovers it on cooling. Nickel may also be obtained in the state of a fine black powder, in which state it takes fire spontaneously in the air. The specific gravity of nickel is 8·2 to 8·6. The nickel of commerce generally contains considerable quantities of cobalt, copper, iron, and silica or sand. The alloys of nickel are generally white and malleable, that which it forms with copper is much used in the arts under the name of German silver. Many of these alloys occur as natural minerals. The atomic weight of nickel is generally taken as 59.

NICKEL, SALTS OF. This metal forms salts which, when in solution or when crystallized, are green in colour, when anhydrous they are generally yellow. It forms with the halogens but one series of salts, viz.:—the *chloride*, $NiCl_2$; the *bromide*, $NiBr_2$; the *iodide*, NiI_2; and the *fluoride*, NiF_2. These salts may be prepared by bringing the respective halogens in contact with the metal: the fluoride is formed by dissolving nickel oxide in hydrofluoric acid. Most of them combine with ammonia to form double salts. With oxygen nickel forms the salts nickelous oxide, NiO, and nickelic oxide, Ni_2O_3, analogous with the two oxides of iron (which see).

Nickelous oxide, NiO, may be obtained by heating the nitrate, carbonate, or hydrate, or by fusing the metal with potassium nitrate. This oxide forms a non-magnetic greyish-green powder, which does not take up oxygen from the air, in which respect it is unlike ferrous oxide. This oxide has been found in nature in regular octahedra, which were opaque, had a metallic lustre, a specific gravity of 6·6, and were nearly insoluble in acids. The hydrated oxide, NiH_2O_2, is thrown down as a pale apple-green precipitate, when excess of caustic potash or soda is added to the solution of a nickel salt.

Nickelic oxide, Ni_2O_3, is obtained by gently heating the nitrate; it is a black powder, which, on being strongly heated, evolves oxygen, being hereby reduced to the lower oxide. When hydrated nickelous oxide is treated with chlorine water it is oxidized to nickelic hydrate, NiH_3O_3, which forms a dark-brown or black mass, ready to part with the elements of water and oxygen when heated.

The *sulphides* of nickel correspond in composition with the oxides NiS and Ni_2S_3; there appears to be also a lower sulphide, Ni_2S.

The *oxygen salts* of nickel are generally soluble in water; the principal are nickel nitrate, $Ni(NO_3)_2$, and sulphate $NiSO_4.7H_2O$.

NICOBAR ISLANDS, a group of nineteen islands in the Bay of Bengal, between 6° 45′ and 9° 15′ N. lat. and 93° and 94° E. lon. They form two groups—a southern group, composed of the islands Great and Little Nicobar and several smaller islets, and a northern group, separated from the southern by Sombrero Channel, about 36 miles broad. The largest of all these islands is Great Nicobar, 30 miles long by 12 miles broad, and the next Camorta, which is the largest of the northern group. They yield cocoa-nuts, plantains, teak, sassafras, and pine-apples. The thick forests and heavy dews render the climate unhealthy for foreigners. The cocoa-nut palm yields the chief food of the natives, and is almost the only tree cared for by them. The Danes formed a settlement here in 1756, and again in 1768, but were obliged to abandon it because of the unwholesome climate. The islands were occupied by Britain in 1869. Pop. 8000.

NICOLAI, CHRISTOPH FRIEDRICH, a German author and publisher, founder of the Allgemeine deutsche Bibliothek, a critical journal, which exercised no little influence on the German literature of the day, was born at Berlin in 1733, and died there in 1811. In 1749 he was sent to Frankfort-on-the-Oder to learn the book trade, and remained there till 1752, when he returned to Berlin. Having become intimate with Moses Mendelssohn he brought out in conjunction with him the first four volumes of the Bibliothek der schönen Wissenschaften (Leipzig, 1757–58), and afterwards, along with both Mendelssohn and Lessing, the twenty-four volumes of Briefe, die neueste Literatur betreffend (Berlin, 1759–65). Finally, in 1765, the Allgemeine deutsche Bibliothek was begun, which continued under Nicolai's direction till 1792. The severity of this work, in which the criticisms were written in a cold, prosaic tone, involved him in many disputes. Nicolai's mind was indeed too mediocre to enable him to appreciate rightly the great achievements wrought by Germany at the close of the eighteenth and beginning of the nineteenth century in literature and philosophy in the works of Goethe, Schiller, Herder, Wieland, Kant, and Fichte. Besides his critical works Nicolai is the author of some novels; but these are of no value.

NICOLAIEV, or NICOLAEF, a town in Russia, in the government of Kherson, and 36 miles north-west of the town of Kherson, at the confluence of the Ingul and Bug. It occupies a large space, is fortified, and well built, with wide streets and a finely planted boulevard. Its principal buildings are a cathedral, with rich internal decorations, and a town-house, with two fine colonnades. It was founded in 1791, and made very rapid progress, having been provided with extensive dockyards, and made the principal naval station of Russia in the Black Sea. This distinction it has lost by the preference subsequently given to Sevastopol, and its commercial prosperity has suffered greatly from the competition of Kherson and Odessa. In the year 1882 the total exports were valued at £1,612,715, by far the greater part of which was for cereals. British shipping engrosses about 75 per cent. of the total carrying trade of this port. Pop. (1880), 82,805.

NICOLA PISANO. See PISANO.

NICOLAS, ST., a town in Belgium, in East Flanders, 19 miles E.N.E. of Ghent. It stands in the Pays de Waes, one of the best cultivated and most populous districts in Europe. Its manufactures are both varied and extensive, consisting of cotton, woollen, linen, and silk goods, lace, hats, soap, chicory, chocolate, tobacco, tobacco pipes, earthen and copper ware, leather, glue, vinegar, &c.; and its trade includes, in addition to these, corn, flax, hemp, hops, &c. Pop. (1880), 25,914.

NICOLAS, SIR NICHOLAS HARRIS, a zealous antiquarian and indefatigable author, was the son of a naval officer, and born at Looe, in Cornwall, on 10th March, 1799; died near Boulogne, August 3d, 1848. He entered the navy, where he acquired some distinction, and attained the rank of lieutenant, but was discharged at the peace of 1815. He then studied law, and was called to the bar in 1825, but never accomplished much in the profession, devoting himself instead to antiquarian literature, including more especially history, genealogy, and heraldry. A mere list of his works in these departments would occupy too much space, and we shall therefore only refer to his Notitia Historica, containing Tables, Calendars, and Miscellaneous Information for the Use of Historians, Antiquaries, and the Legal Profession (1824), afterwards remodelled for Lardner's Cabinet Cyclopedia under the title of the Chronology of History, and containing much valuable information; Controversy between Sir Robert Grosvenor

and Sir Richard Scrope in the Courts of Chivalry, A.D. 1385–1389, including a life of Chaucer, which was afterwards extended and prefixed to Pickering's Aldine edition of his works, and is the best life of the poet that has yet been written; Lives of Izaak Walton and Charles Cotton; History of the Orders of Knighthood of the British Empire and of the Order of the Guelphs of Hanover; The Despatches of Admiral Lord Viscount Nelson (seven vols. 1844–46); and The History of the British Navy (in two vols. 8vo, unfinished). In editing works written by others, or printed from ancient MSS., such as The Memoirs of Lady Fanshawe and A Chronicle of London from 1089 to 1483, he enriched the text with so much valuable matter, in the shape of annotation and critical remark, that they almost take the place of original compositions. In 1831 he was created a knight of the Hanoverian Guelphic order.

NICOLE, PIERRE, one of the recluses to whom Port Royal is so much indebted for its fame, was born at Chartres in 1625; he died at Paris, November, 1695. After making himself thoroughly acquainted with Greek and Latin he proceeded to Paris. Having been admitted to Port Royal he was employed in teaching, and had a principal share in drawing up several of the educational treatises of the establishment, and more especially the well-known treatise entitled La Logique ou l'Art de Penser, which possesses so much merit that a new English translation of it has been very recently published and favourably received. Nicole was a man of peace, and had a placid temper, which contrasted strongly with the restless and fiery energy of his friend Arnauld (his associate in the preparation of La Logique), but he disdained to purchase peace by a dereliction of duty, and was ever ready to give his exertions fully and freely when any good cause commanded them. He was on terms of great intimacy with Pascal, and when the Jansenist controversy arose not only encouraged him in the composition of his inimitable Provincial Letters, which mainly contributed to the suppression of Jesuitism, but furnished no small portion of the materials, drawing upon the stores of his learning for the facts and quotations which Pascal turned to such good account. The Latin translation of the Letters, published in 1658 under the fictitious name of Gulielmus Wendrockius, was executed by Nicole, and he also drew up the series of notes and dissertations which accompany the best edition of them, and make it a complete repository of all that is most important on the Jansenist side of the Jesuit controversy. The other works by which he is best known are his Essais de Morale. He also wrote various theological treatises, among which are a Traité de l'Unité de l'Eglise, which Roman Catholics boast of as triumphant but Protestants regard as at best but specious.

NICOMEDIA, the chief city of Bithynia and residence of the Bithynian kings, named after its founder, Nicomedes I. (B.C. 278–250). It was situated at the north-eastern corner of the Sinus Astacenus (Gulf of Izmid), an arm of the Propontis (Sea of Marmora). It was a city of great splendour, and in later times was a favourite place of resort with the emperors Diocletian and Constantine the Great. Arrian the historian was born and Hannibal died here. It is now called Izmid or Izmikmid, and is a town of about 30,000 inhabitants.

NICOPOLIS (City of Victory), the name of many ancient cities—1. One of the most celebrated is that in Epirus on the northern side of the Ambracian Gulf (Gulf of Arta), built by Augustus in commemoration of his naval victory over Antony at Actium, the opposite promontory, which made him master of the Roman Empire. Augustus built at the same time a temple on the neighbouring hill in honour of Apollo, and instituted games to be celebrated every fifth year. Ruins of this city are still to be seen near Paleoprevyza.——2. Now *Nicopoli*, a city on the Danube, in Moesia Inferior, built by Trajan in memory of a victory over the Dacians. It is still an important town and a place of considerable strength, capital of a siva of the same name, 54 miles west of Rustchuk and 234 miles north-west of Constantinople. It is the seat of a Greek archbishop and a Roman Catholic bishop. Bajazet I., the Turkish emperor, gained a victory here over Sigismund, king of Hungary, in 1396. Pop. 20,000. ——3. A city in Lower Egypt, a little to the east of Alexandria, built by Augustus to commemorate his final victory over Antony.

NICOSIA, a town in the province of Catania, Sicily, on two hills washed by the Salato and Capizzi, 39 miles W.N.W. of the town of Catania. It has some trade in wine, oil, cattle, and grain; and in its vicinity are beds of alum schist, a rich mine of rock-salt, and springs of petroleum and sulphur. It is the seat of a bishop and of a royal college. Pop. (1880), 15,226.

NICOSIA, or LEFKOSIA, the capital of the Island of Cyprus, situated in the centre of the island, on a fine plain watered by the Pedia. It was once remarkable for its beauty, and with its lofty walls and bastions still presents an imposing appearance, though its interior everywhere exhibits marks of decay. One of its ancient churches, a fine Gothic building, has been converted into a mosque. It has manufactures of carpets and red morocco leather, and makes excellent wine. It is the seat of a Greek archbishop. It has been improved under British administration. The pop. is about 12,000.

NICOT, JEAN, born at Nîmes in 1530, appointed by Francis II. French ambassador at the court of Portugal, where he was presented with some seeds of the tobacco plant, which he introduced into France about 1560. The botanical term for tobacco (*Nicotiana*) is derived from his name. He died at Paris in 1600.

NICOTINE. By a proper treatment 2 lbs. of tobacco yield about 50 or 60 grains of a colourless, transparent oil, having a very irritating vapour and an intensely burning taste. This oil is called nicotine: on analysis members are obtained which agree with the formula $C_{10}H_{14}N_2$, and on studying the reaction of this substance the rational formula $N_2(C_5H_7)_2$ is adopted, which may be represented as two molecules of ammonia in which the whole of the hydrogen is replaced by the two trivalent molecules C_5H_7. Nicotine boils at 250°; it is very poisonous, 5 milligrams being sufficient to kill a middle-sized dog in three minutes: a very small quantity, if dropped into the eye of a cat causes contraction of the pupil. Nicotine has a strongly alkaline reaction. The following table shows the per centage of nicotine in various kinds of dried tobacco:—

Lot.	Nord.	Alsace.	Virginia.	Kentucky.	Maryland.	Havannah.
7·96	6·58	3·21	6·87	6·09	2·29	2·00.

Nicotine forms a large series of salts, which are analogous with the salts of ammonium, indeed this alkaloid resembles ammonia very closely in its chemical characteristics; its reaction is strongly alkaline. It saturates acids to form salts, and it forms a double chloride with platinum.

Nicotine likewise forms a series of double metallic salts, such as $C_{10}H_{14}N_2.HgCl_2$, $C_{10}H_{14}N_2.HgI_2$, &c. &c. Part of the hydrogen may also be replaced by many of the organic alcohol radicles, giving rise to a series of substances the first of which, *methyl nicotine*, has the formula $N_2(C_{10}H_{12}(CH_3)_2)$.

NICTITATING MEMBRANE, or 'THIRD EYELID.' This structure is seen typically in Birds, but also in certain Fishes (for example, Sharks), in some Reptilia and Amphibians, in the lower Mammalia (Monotremata and Marsupialia), and in some of the higher Mammalia also. In Birds the nictitating membrane exists as a membranous or transparent structure, placed on the inner side of the front of the orbit or eye-cavity. In connection with the 'third eyelid' — so named from the development of the ordinary eyelids as well — a special muscular apparatus is found, and by means of this latter the membrane may be drawn across the eye, after the fashion of a curtain, and serves in this way to modify the light, and also to clear the surface of the eye. The nictitating membrane is represented in a rudimentary condition in Man, and higher Mammals generally, by the *plicæ semilunares*, or 'semilunar folds,' situated at the inner or nasal angle of the eye.

NIEBELUNGENLIED. See NIBELUNGENLIED.

NIEBUHR, BARTHOLD GEORG, a distinguished historian, born of German parents at Copenhagen, August 27, 1776; died at Bonn, January 2, 1831. When he was two years old his father removed to Meldorf, in Ditmarsh, and here young Niebuhr's education began. In 1792 he was sent to a commercial school at Hamburg, in 1793–94 studied law at Göttingen, and from 1794 to 1796 attended the University of Kiel. In 1796 he was appointed secretary to the Danish minister of finance, but disliking this situation, took the earliest opportunity of exchanging it for that of under-librarian in the royal library of Copenhagen. This situation he held till 1798, in which year he set out on a visit to England. During this visit he spent a session at the University of Edinburgh, applying himself chiefly to chemistry and natural philosophy. On his return home at the close of 1799 he received two small appointments from the Danish government, and he continued to be employed in the Danish service till 1806, when he entered that of Prussia. In 1808 he was appointed councillor of state, and received an office in the ministry of finance. In 1810, when the University of Berlin was established, his friends persuaded him to deliver his first lectures on Roman history, which were received with such interest by the hearers, and so much commended by men like Buttmann, Heindorf, Spalding, and Savigny, that he published in 1811 and 1812 the first two volumes of his Roman History. After the destruction of Napoleon's army in Russia he made his voice heard among the loudest of those who endeavoured to rouse the German nation to put down their oppressor, and was even drilled for a time as a recruit in the German army. He did not, however, actually take part in the campaign against Napoleon, having been invited by Stein to assist him in the administration. He accepted this offer, but soon after broke the connection with Stein. His temper was indeed too irritable and peremptory for a practical politician, and he was dissatisfied when his own ideas were not carried out in every particular. In 1816 he was appointed Prussian minister to the Papal see, and on his passage through Verona to Rome he discovered in the cathedral library of the former city a palimpsest manuscript of the Institutions of Gaius. (See GAIUS.) The chief object of his mission was to arrange with the pope the reorganization of the Catholic Church in the Prussian dominions, which was finally settled by the Prussian concordat, which was signed on behalf of the Prussian government by Prince Hardenberg at Rome in 1821. Pius VII., himself a lover of science, had a great regard for Niebuhr. Even before Niebuhr went to Italy his attention had been directed to the importance of the palimpsests or Codices Rescripti, and the discovery of the Institutions of Gaius added to his interest in the subject, so that he spent much time in Rome in an accurate examination of the manuscripts of the Vatican Library. His residence in Rome gave him an intimate knowledge of the localities of the city, and a clearer conception of its ancient character and history. His knowledge in this branch appears in his contributions to Bunsen and Plattner's Beschreibung der Stadt Rom. Before his return to Germany Niebuhr went to Naples, where he devoted some hours every day to the collation of the best manuscript of the grammarian Charisius in the library of that city. In Switzerland he remained six weeks in St. Gall examining laboriously the manuscripts of the library. Here he discovered some remains of the latest Roman poetry, the poem of Merobaudes, which he published at Bonn in 1824. From Switzerland he went to Heidelberg, and thence to Bonn on a visit to Brandis, the historian of philosophy. He was still nominally ambassador to the Papal see, and uncertain whether he should not be required to return to Rome; but on returning to Berlin, which he did immediately after his visit to Bonn, he was released from his duties, and rewarded for his services with a pension. He was thus enabled in 1824 to gratify the desire he had formed of settling at Bonn, where he was appointed adjunct professor at the university, with the duty of delivering lectures upon ancient history. He now applied himself to the continuation of his Roman History, of which nothing had appeared since the two volumes that were published in 1812, although he had resumed its composition while residing at Rome. Before publishing the third volume he determined to remodel the first two, as further researches had changed his views in many respects. Vol. i. appeared in 1827, and was so well received that a new edition appeared in 1828. In the same year appeared his edition of his Kleine Schriften. The second volume was in its new state finished and published only a few months before his death, and in the preface he says that the melancholy influence of recent political events (those of 1830) upon his mind appears in the mode of the execution of the concluding part of the work. The third volume was published posthumously in 1832. The work was received with great admiration not only in Germany but also in foreign countries, especially in England. The first two volumes had already been translated into English in their original form by Walter, and were now translated in their revised form by Hare and Thirlwall, and the third by Smith and Schmitz (the last one of Niebuhr's pupils). The peculiar feature of Niebuhr's history was not so much his demonstration of the legendary character of what had been handed down by tradition as the early history of Rome (for this had been admitted before Niebuhr) as his attempt to reconstruct the history of that period by discriminating what was really historical in the traditional matter. When the work appeared it was regarded as making an epoch in the treatment of Roman history, which it still is in a certain sense, although the correctness of Niebuhr's leading conclusions, and even the soundness of his method, have since been called in question, among others by Schwegler in Germany and George Cornewall Lewis in this country. During his stay at Bonn Niebuhr conceived the idea of bringing out an edition of the Corpus Scriptorum Byzantinorum, of which he himself undertook the superintendence, and to which he contributed an edition of Agathias. His lectures at Bonn were published in German at Berlin in 1846–47. Independently of this edition, three courses of his lectures, compiled from notes taken in the lecture-room by Dr. Schmitz, were published in

English. These three courses are respectively entitled Lectures in Roman History, Lectures on Ancient Ethnography and Geography, and Lectures in Ancient History; and the last of them, which brings the history of Rome down as far as Constantine, may be regarded as in some sort a continuation of Niebuhr's great historical work. A biography of Niebuhr, founded on his letters and the recollections of some of his friends, was published at Hamburg in 1838, under the title of Lebensnachrichten über Niebuhr; an English biography by Miss Winkworth (the Life and Letters of B. G. Niebuhr) was published at London in 1852.

NIEBUHR, KARSTENS, a German traveller, father of the celebrated historian, born in Hanover in 1733; died in 1815. In 1760 he entered the Danish service as lieutenant of engineers, and in the following year joined the expedition sent by Frederick V. of Denmark to explore Arabia. Having seen all his companions in this expedition die in succession within a year after their departure, he continued the journey alone, and in 1766 returned to Copenhagen with a large store of valuable observations made in this hitherto almost unknown region. In 1768 he was made captain of engineers. The last years of his life were passed at Meldorf in Ditmarsh, where he held an appointment under the government. The works in which he gave to the world the results of his expedition are remarkable for their accuracy. They are entitled Beschreibung von Arabien (Copenhagen, 1772) and Reisebeschreibung von Arabien und anderen umliegenden Ländern (two vols. Copenhagen, 1774–78). A biography of him was written by his son the historian, and published at Kiel in 1817.

NIELLO (Italian), a species of work used among the Romans and modern Italians, somewhat resembling Damascus work, and believed to be performed by enchasing a mixture of silver, lead, copper, sulphur, and borax into cavities and holes cut in all sorts of hard wood and metals. This art was denominated by the ancients *nigellum* (somewhat black), and was used by them to decorate a great variety of things, and more especially *candelabra*. It was chiefly practised by the jewellers and goldsmiths of the fifteenth century.

NIEMBSCH VON STREHLENAU, a German lyric poet, better known by the fictitious name of Nikolaus Lenau, was born in 1802 at Csatad in Hungary. After completing his philosophical course at Vienna he devoted himself first to the study of law, and then to that of physic, without being able to decide resolutely in favour of either. His poetic powers were strengthened by extensive journeys through the Austrian Alps, and in 1832 by a visit to America. After his return he lived alternately in Vienna, Ischl, and Stuttgart. At the last place, in 1844, when on the eve of setting out to Frankfort-on-the-Main to be married, he was seized with a mental malady. He never recovered effectually, and died in an asylum at Vienna in 1850. He first appeared as a writer in 1832 with a collection of poems, which was followed by another in 1838. To the more formal excellencies of these poems an exquisite harmony of versification is superadded. Exhibiting great variety in their contents, the greater number are thoroughly imbued with a vivid and often profound comprehension of nature, while they also abound with reflections and imagery which give to the whole a remarkable freshness, truth, and originality. His powers appear to the greatest advantage when he confines himself to the simplicity of the popular ballad, and more especially when in this spirit he arrays his verse in imagery drawn from his native land. His poems of this class are also tinged with a deep melancholy which not unfrequently borders on the terrific, though without actually overstepping the limits of the beautiful. His Polish songs, which are strictly elegiac, have greatly contributed to extend his fame. His larger poems, Faust, Savonarola, and the Albigenses, particularly the last, give many evidences of vigour and originality, but are far inferior to his lyrics. An edition of his works was published at Stuttgart in 1855.

NIEMEN, or MEMEL, a large river of Lithuania, which rises in the Russian government of Minsk, flows at first west through the governments of Vilna and Grodno, and past the town of Grodno; then north, forming the boundary between Poland and the government of Vilna; then again west, separating Kovno and Poland, and finally enters East Prussia, passes Tilsit, and falls into the Kurisches Haff. The Tilsit plain suffered severely from an inundation in 1829, by which the river dikes were much injured. The Niemen is navigable in summer as far as Grodno, and facilitates the commerce of Memel and Königsberg. The total length of its course is about 450 miles. The meeting of Napoleon with the Emperor Alexander and Frederick William, king of Prussia, which took place on a raft in this river in 1807, gives it an historical celebrity.

NIERENSTEINER, or NIERSTEINER, a Rhenish wine which takes its name from Nierenstein, a village on the left bank of the Rhine, in the Grand-duchy of Hesse-Darmstadt, about 8 miles south of Mayence.

NIÈVRE, a department of France, bounded north by Yonne, west by Cher, south by Allier, south-east and east by Saône-et-Loire, and north-east by Côte-d'Or; area, 2631 square miles. It is intersected by a mountain range separating the basins of the Seine and Loire, is only of indifferent fertility, produces some good wine, particularly the much-esteemed white wine of Pouilly, and has nearly a third of its surface covered with wood. Its minerals include iron and coal of excellent quality, and both extensively worked; beds of yellow ochre, grinding-stones, marble, and granite. The only manufactures deserving of notice are some coarse woollen cloths, linen, cutlery, works in enamel, common pottery, and porcelain. Nièvre is divided into four arrondissements—Nevers, Château-Chinon, Clamecy, and Cosne. The town of Nevers is the capital. Pop. (1881), 347,576.

NIFLHEIM. See NORTHERN MYTHOLOGY.

NIGER, the name now commonly given to the great river of Western Africa, which, rising in the country of the Mandingoes, and flowing north and north-east towards the desert, afterwards turns south-east and south, and enters the sea through many mouths in the Bight of Benin. The source of this great river is, according to Major Laing, at Mount Loma, in about lon. 9° 45′ W.; lat. 9° 25′ N., and 1600 feet above sea-level; but there is good reason for believing that it may be sought much further to the south and east in the Kong, or mountains, for Kong is a general term, and not a proper name. Lower down in Bambarra it is entitled Joliba, that is, the River of the Joli, or Red Men, who are the inhabitants of Joli-nke-ndu (Red Man's Land), the Jallonkandoo of Park. These Red Men are Susu, or Mandingo. It becomes navigable at Bammakoo, 100 miles above Sego in Bambarra, and at the latter place it is as wide as the Thames at Westminster. Lower down it enters a level country, and divides into several arms, inclosing extensive islands, on one of which stands Jenne, or Ginne, the great emporium of Negroland. The river then enters on a territory in which the Fulah or Fellatah are the rulers, while the indigenous population are called Songay. In its course down to Ginne the Joliba receives several accessions from the south. Further on it turns northwards, in a very winding course between low banks, crossing

Debu, or Blackwater Lake, and receiving on the right numerous streams from the mountainous country of the Songay. At Kabara, the port of Timbuctoo, it turns east along the desert for six days, and south-east for about 15 days to the frontiers of Houssa. From Ginne to Sai, opposite to Houssa, a distance of 800 or 1000 miles, the Songay language is spoken on the right bank of the river, and from Sai also it extends on the left bank eastwards to Asben or Aghades on the borders of the desert. In the Houssa country the great river is known as the Gulbi-nkowára, that is, the River Kowára, or Kwára (Quorra); and further south, in Nyffé, where it is often a league wide or more, it is entitled the Sea or Lake of Nyffé or Kwára. The very active commerce which here animates in the heart of Africa the broad waters of the Kwára or Quorra fully justifies the celebrity of its name. Through Houssa and Nyffé flow several streams from the heights which divide those countries from Bornou, while on the western side, through Guinea and Bergoo, the Kwára receives the small rivers which descend from the mountains of the Songay, which will probably be found to strike from south-west to north-east. From about lat. 12° N., where it receives the Sokoto, to lat. 7° 46′ N., where it unites with its chief tributary, the navigable Benuwe (which see), it is navigable only during the rainy season. After receiving the Benuwe the river flows almost due south to Aboh, about 100 miles from the sea, where it forms a delta. This delta covers an area of about 14,000 square miles, completely intersected by branches of the river, the principal of which, the Nun, runs through the middle of the delta. The westernmost branch is the Benin, which, with an estuary 1½ mile wide, narrows a little way up to 120 yards. It has a bar, which presents a great difficulty to sailing vessels. The whole course of the great river from Mount Loma to the mouth of the Nun, without regard to sinuosities, is about 2000 miles. Mungo Park was among the first European travellers who explored any part of this river (1796–97); its mouths were discovered by the brothers Lander in 1830.

NIGHT-BLINDNESS, a disease in which the eyes require the full light of day to see. Persons afflicted with this disease cannot see at all, or see very imperfectly, by candlelight or moonlight. The medical name of this disease is *hemeralopia* (from *hemera*, day, and *ōps*, the eye). Heber says it is very common in India.—*Nyctalopia* (from *nyx*, night, and *ōps*), a disease in which the patient sees little or nothing by daylight, but sees better than others in the dark, is sometimes improperly called night-blindness.

NIGHT-HAWK and NIGHT-JAR, names applied to two prominent members of the family Caprimulgidæ or 'Goat-suckers,' included in the Fissirostral section of the Insessores (which see), or Perching Birds. The Night-hawk is an American representative of the family (*Caprimulgus Americanus*); whilst the Night-jar, or Night-churr, is the *C. Europæus*, or Common Goat-sucker, the only British species of this group, and which gains this appellation from the shrill whirring sound which it produces. The Night-hawk of America, like the European species, appears to be migratory in habits. It arrives in Pennsylvania about the end of April, and is nocturnal in habits, thus resembling the other members of the family. The food consists of insects, such as nocturnal beetles and moths, which it pursues on the wing with great activity. The eggs, two in number, of oblong shape, and coloured a dirty bluish-white with patches of dark olive-brown, are produced about the middle of May, and are deposited on the bare ground in a dry situation, no nest being constructed. This bird, like the common goat-sucker, perches lengthwise on the branches of trees, and not across them, after the fashion of other birds, the feet being short and of weak conformation. The male maintains a vigilant watch whilst incubation continues. The young, when hatched, are covered by a downy coat of pale brownish tint. In its habits of flight the Night-hawk possesses strong powers. It frequently visits the neighbourhood of cities, and may then be heard to utter its peculiar cry, which somewhat resembles that of its European neighbour, and consists of a sharp squeaking note combined with a hollow sound, comparable to that produced by blowing into the bung-hole of an empty barrel. The usual time for these birds to appear varies from about two hours before sunset till dark; but in gloomy or dull weather they may be seen in flight during the day. About the middle of August these birds migrate southwards, and few are seen in Pennsylvania at the middle of September. The Night-hawk attains a length of 9 or 10 inches. It is coloured a deep blackish-brown on the upper parts, spotted with fine patches, and with streaks of a light or cream colour on the back and head. The tail is forked, and is a little shorter than the wings when in repose. The gape is large, but destitute of bristles. The other American species are the 'Chuck-Will's Widow' (*C. Carolinensis*) and the 'Whip-poor-Will' (*C. vociferus*)—these curious names being derived from the general sound of their notes, which are said to closely imitate their popular appellations. These species arrive in the United States in May, and like the Night-hawk leave the States in September.

Louisiana, Florida, and the lower portions of Alabama and Georgia are the parts in which the Chuck-Will's-Widow is most abundant. It haunts deep ravines, shady swamps, and pine forests; roosting during the day in the hollow of some decayed tree, and coming out at the approach of night, when the woods re-echo with its singular note. It generally utters its cry when seated on a fence stake, or the dead branch of a tree, repeating it a number of times in succession with great power and clearness. Its food is insects, which it seizes on the wing, either in their flight, or as they crawl on the ground or on a tree. Its flight is very easy and graceful, and its power of wing is very great. This bird makes no nest, but merely scratches a slight hollow on the ground among the dead leaves, and deposits its eggs there. They are two in number, dull olive, and speckled with brown. If the eggs are handled the male and female birds remove them to some other place, carrying them in their large mouths. They become silent as soon as the young are hatched, but resume their cry before their departure. The head of these birds is disproportionately large, and the gape is enormous. The prevailing tint of the plumage is dark brown and blackish, with yellowish-red markings. See GOATSUCKER and WHIP-POOR-WILL.

NIGHTINGALE, a celebrated song-bird included in the family Sylviadæ or Warblers, which forms one of the divisions of the Dentirostral section of the order Insessores or Perching Birds. By some authorities a sub-family, that of the Sylvinæ or True Warblers, is constituted for the reception of the Nightingales, Warblers, and other allied forms. The Nightingale (*Philomela luscinia*) is attractive for no lustre or brilliancy of plumage; the upper parts of the body being of a rusty brown colour tinged with olive, and the under parts of a paler ash colour, blending into white at the throat and belly. Its average length is about 6 inches. In habits the Nightingale is active and lively; it frequents trees and bushes of small size, and subsists chiefly upon an insectivorous dietary. It is a migratory bird, and

arrives in Britain about the beginning or middle of April, leaving on the approach of autumn. In its distribution it appears to affect a straight line running north and south; and in this way it is never or rarely heard in Wales or the western districts of England, and not at all in Ireland. Its northernmost limit appears to be fixed at or near the city of York. In Scotland it is therefore almost unknown. But eastwards from England the distribution of the nightingale extends into Sweden, Denmark, and even to Russia. The male birds arrive in Britain before the females. The song continues until the middle of June, when the young are hatched. The male bird sings during the day, and at night also, whilst the female is incubating; and the flood of song poured forth in the stillness of the evening forms one of the chief sources from which the reputation of the nightingale has been derived. These birds appear to be solitary in their habits. The nest is of rough construction. It is generally formed of leaves and grasses, and is situated mostly in damp places or in the neighbourhood of water. The eggs number from four to five, and are of an olive-green colour. These birds live in confinement. The bird-catchers, if possible, take the males before the arrival of the females. Birds trapped after the pairing season are said to languish and die (Pl. CXLII.–CXLIII. fig. 17).

NIGHTMARE, a state of oppression or feeling of suffocation which sometimes comes on during sleep. The sufferer experiences a short period of intense anxiety, fear, horror, &c.; feels an enormous weight on his breast; is pursued by a phantom, monster, or wild beast, which he cannot escape; is on the brink of a precipice, from which he cannot remove, or is, perhaps, rolling down it without being able to make any exertion for his safety, and his limbs refuse to do their office, until he suddenly awakens himself by starting from his recumbent posture, or by a loud cry; he is then in a state of great terror, and the body is often covered with sweat. In ancient times and during the middle ages this state was believed to be produced by demons, called by the Greeks *ephialtai*, and by the Romans *incubi* or *succubi*. It was a common superstition that women sometimes bore offspring to such nocturnal demons, and some noble families in the middle ages were even supposed to have had such an origin. Nightmare is generally owing to repletion and indigestion, and is often superinduced by lying on the back, especially when the head is low. It is most common in those seasons of the year which most increase the volume of the fluids—in spring and autumn. The treatment for nightmare consists in the use of emetics and purgatives, which may be assisted by bathing the feet. If the sufferer is of a full habit of body, bleeding may sometimes be resorted to. A person subject to attacks of nightmare should pay particular attention to sobriety, should abstain from suppers, and in general should avoid all succulent food. Homer (Il. xxii. 200) and Virgil (Æn. xii. 908) have given striking pictures of its benumbing power, and Fuseli has represented its agonies. He is said to have eaten an immoderate supper of raw pork for the purpose of obtaining a vivid conception of his subject.

NIGHTSHADE, the name given to species of Solanaceæ, the Potato order, and of Atropaceæ, the Deadly Nightshade order. The two orders are nearly allied, but the species of the latter are generally narcotic poisons, and their juice has the property of causing the pupil of the eye to dilate; while the plants of the former order do not exhibit the same marked narcotic properties, nor, it is affirmed, does their juice cause dilatation of the pupil. *Solanum Dulcamara*, the bitter-sweet, is sometimes called woody nightshade. The stem is woody, and divides at the base into several long, flexuous branches, which twine round and support themselves upon the surrounding plants. The leaves are some of them oval-lanceolate and entire, and others with two lateral lobes at the base. The flowers are of a fine violet colour, and are disposed in corymbs along the branches. The fruit consists of ovoid, bright red berries, which, if not absolutely poisonous, are extremely suspicious. The berries of *S. nigrum* are edible. The deadly nightshade (*Atropa belladonna*) is, on the other hand, a dangerous plant, and produces fatal effects. The stem is about 3 feet high, a little hairy, herbaceous, and branching. The leaves are large, oval, acute, and softly pubescent. The flowers are solitary, bell-shaped, and of a dull purple colour. The berries have a sweetish and rather agreeable taste, which renders them the more dangerous. The extract dissolved in water and applied to the eye eminently possesses the remarkable property of dilating the pupil, and is, in consequence, employed in surgical operations for that purpose.

The deadly nightshade contains an alkaloid called *atropine*, which may be extracted by treating the roots of the plant with strong alcohol, allowing the extract to remain for some time in contact with caustic lime, driving off the alcohol by a gentle heat, filtering, adding sulphuric acid and then a concentrated solution of potassium carbonate, and again filtering. Atropine forms colourless, silky needles; it is slightly soluble in water, but dissolves easily in alcohol; it is very poisonous, and has the peculiar power of causing persistent dilation of the pupil of the eye. The composition of this alkaloid is expressed by the formula $C_{17}H_{23}NO_3$. Besides this alkaloid, another compound of carbon, hydrogen, nitrogen, and oxygen is said to exist in the nightshade; to this alkaloid—about which very little is known—the name of *belladonnine* is given. From the seeds of the deadly nightshade an oil may be expressed. This oil is limpid, golden yellow in colour, insipid, and without odour.

NIGRITIA. See SOUDAN.

NIHIL ALBUM, a name formerly given to the white oxide of zinc.

NIHILISTS, a party in Russia, of recent origin, the adherents of which mostly acknowledge materialism as their philosophical creed, but are chiefly characterized by their social and political aims. Alexander Herzen, who, by the foundation of the Free Russian Press, called into life an active propaganda for liberal and democratic ideas in Russia, gave the first impulse to the formation of this party, but the true apostle of Nihilistic ideas is Chernyshevski. The leading idea of Chernyshevski and the Nihilists is that no considerable advance can be made by mankind without an entire reconstitution of society, beginning with a sudden economical reform, or rather revolution, the chief features of which must consist in the carrying out of the principle of common property in land, and of communistic principles generally. In politics the Nihilists favour the federative principle, and are especially antagonistic to the ultra-patriotic pretensions of the Panslavists, upholding the idea of cosmopolitanism in opposition to that of nationality. The Nihilists publish various journals, but are obliged to disseminate them in secret. In attempting to carry out their aims they do not hesitate to resort to deeds of the blackest atrocity. Assassination is common among them. Their most daring act of this kind as yet has been the assassination of the Emperor Alexander II., March 13, 1881. The deed was perpetrated on the public street by means of an explosive bomb. Several Russian officials of high rank have also been made their victims, both before and since that time. The number of the Nihilists, according to all information, is small.

NIIGATA, a town in Japan, on the west coast of the island of Niphon, nearly opposite to the island of Sado, at the mouth of the Shinanogawa. It is one of the ports opened by Lord Elgin's treaty in 1860. It has little foreign trade owing to the fact that there is a bar at the mouth of the river which ships of large burden are unable to cross, but its coasting trade carried on by Japanese junks and its internal trade are large and increasing. The streets are traversed by canals. Pop. (1881), 37,272.

NIJMEGEN, or NIMEGUEN (anciently *Noviomagus*, or *Noeomagus*), a strong city in the Dutch province of Guelderland, delightfully situated on a steep hill, reaching down to the Waal. On a height near the river are seen the ruins of an old tower, said to have been built by Charlemagne. The town-house contains a rich collection of Roman antiquities. The Belvedere, a high tower, from which there is a most extensive view, is near the beautiful public walk, the Kalverbosch. The industrial occupations include tanning, brewing, cotton manufactures, salt-refining, and making of articles in copper. There is a trade in corn and wine. Nimeguen is celebrated for the treaty of peace concluded August, 1678, between France and Holland, and acceded to by Spain 17th September, and for that of 1679, between the German Empire, France, and Sweden. Pop. 24,897.

NIJNEI-NOVGOROD (Lower Novgorod), or NISHEGOROD, a government in Russia, bounded north by the governments of Kostroma and Viatka, east by Kasan and Simbirsk, south by Penza and Tambov, and west by Vladimir; area, 19,704 square miles. The surface forms an extensive plain, occasionally broken and diversified by low undulating hills. These hills are almost invariably composed of limestone, which is largely developed over the whole government. The only metal found is iron; gypsum prevails in every quarter. The entire government belongs to the basin of the Volga, which, entering it on the north-west, and traversing it in one vast curve to the east, drains a considerable portion of it directly, all the other drainage being brought to it by the Oka and its tributaries on the west, the Sura and its tributaries on the east, and the Senets and Vetluga on the north. The soil is of remarkable fertility, rendering this government the granary of Russia. The cultivators are alike distinguished by skill and industry. The principal crops, in addition to the ordinary cereals, are hemp and flax. Much attention also is paid to the production of fruit. The extent of forest is at least equal to that of arable land, and few governments can boast of larger tracts of excellent timber. Both manufactures and trade have made great progress. Several governments possess much larger establishments, but in none is the spirit of activity and enterprise more universal. The principal manufactures are coarse cloth, canvas, cordage, glass, soap, and leather. The same articles form important branches of trade, which includes, besides corn, flour, hemp, and flax, iron and ironmongery, &c. The central position of this government, and its large navigable streams, are highly favourable to its trade. Pop. 1,369,369.

NIJNEI-NOVGOROD, a town in Russia, capital of the government of same name, at the confluence of the Oka and Volga, 255 miles east of Moscow. The Kremlin, finely situated on the loftiest point of the high town, is surrounded by a lofty wall flanked with towers, round or square, and contains the principal edifices, particularly two cathedrals, the governor's palace, and an episcopal seminary. With the exception of these, the elegant church of the Holy Women, and a few other public edifices, the whole town is built of wood, and possesses little interest. It has large manufactures of leather, cotton, cordage, &c., and at all times a great trade; but its chief celebrity is its great annual fair, which has been held here since 1816, and collects dealers and loungers to the number of 250,000. It lasts from June 25 to Sept. 5 O.S. As the period for the fair approaches there suddenly starts up what has all the appearance of a regular town, consisting not of mere sheds but of substantial wooden houses, including churches, theatres, hospitals, barracks, and a handsome edifice where the governor resides with a numerous train of officials. The boats employed in delivering or securing cargoes cover the bosom of the water, and whole towns of boats are formed for temporary residence. The business done at the fair still goes on steadily increasing. The annual value of the merchandise sold already considerably exceeds £20,000,000. The chief trade is done in corn and flour, and after that in tea. Pop. 12,441.

NIJNEI-TAGILSK, a town in Russia, in the government of Perm, and 150 miles east of the town of Perm, in the midst of a district very rich in minerals. The inhabitants are chiefly employed in smelting. The population along with that of the adjoining places amounts to 30,000.

NIKE, in Greek mythology, the goddess of victory, daughter of Pallas and Styx, and sister of Zēlos (zeal), Kratos (strength), and Bia (force). She was rewarded by Zeus with the permission to live in Olympus, for the readiness with which she came to his assistance in the war with the Titans. There is a temple to her on the Acropolis of Athens still in excellent preservation. She is represented as resembling the goddess Athena (Minerva), but with wings, and carrying a palm or a wreath. The corresponding Roman goddess was Victoria, to whom Evander is said to have dedicated a temple on the Palatine Hill at the command of Minerva, on the site of which L. Postumius afterwards (during the war with the Samnites) raised another in her honour.

NIKOLAEF. See NICOLAIEV.

NIKOLAIEVSK, a new town in Siberia, in the maritime district, near the mouth of the Amur. It was founded in 1851. It is connected by telegraph with St. Petersburg. Pop. 5314.

NIKOLSBURG, or NIKLASBURG, a town in Moravia, in the circle of Znaim, 27 miles south of Brünn. It consists of narrow, ill-paved, and dirty streets, but has a castle finely situated on a rock near its centre, a handsome church, and a Piarist college. There are linen and woollen manufactures and some trade. Pop. (1880), 7642.

NIKOPOL, a town in Southern Russia, in the government of Ekaterinoslav, on the Dnieper, where that river separates the governments of Ekaterinoslav and Taurida. It is the centre of a rich agricultural district. There is regular steam communication between Nikopol and Odessa on the Black Sea. Pop. 9706.

NILE, the largest river in North Africa, is formed by two streams which unite in the uplands of the northern frontier of Abyssinia. The eastern and shorter of the two, the Blue River or *Bahr-el-Azrek*, the source of which was discovered by Bruce in 1770 in the Abyssinian highlands, in lat. 11° N.; lon. 36° 30′ E.; flows first north into Lake Dembea or Tsana then emerges from it in an easterly direction, describes a great arc to the south, extending below lat. 10° N., then turns to the west, enters Egypt, where it receives its southern tributary, the Dedhesa, and lastly takes a northerly course. After receiving from the east the rivers Dender and Rahad, it unites at Khartoom with the great western branch, the White River or *Bahr-el-Abiad*, which is by far the more considerable of the two, both in length and volume of water. The position of the source or sources

of this larger branch remained for ages an unsolved problem with geographers, but has at last been definitively settled. The explorations of Speke and Grant in 1861–62, and of Sir Samuel Baker in 1863–64, the results of which have been confirmed by those of more recent travellers, have established the fact that the head-waters of the Nile are collected by a lake situated on the equator, called Ukerewe or Victoria Nyanza, a large lake, 3808 feet above the level of the sea, previously discovered by Speke.

Of the influents of this lake the most important, according to Stanley, who visited and circumnavigated the lake in 1875, is the Shimiyu, which flows into it from the south with a width of about a mile at the influx; and the source of this stream, the highest feeder of which is called the Liwumba and rises about 5° S. lat. and a little to the east of 34° E. lon., is accordingly the remotest source of the Nile yet known. Among the other principal influents of the Victoria Nyanza are the Kagera or Kitangule, which enters it on the west and is next in size to the Shimiyu, and the Ruana, which is the largest of those which enter it on the east. The great river which flows out of Lake Victoria Nyanza, and which is now identified with the Nile, issues from the lake in the north at about lat. 0° 30′ N., and lon. 33° 40′ E., and before its identity with the Nile was known, was called the Kari or Somerset River. At its outflow from the lake it forms the unimportant Ripon Falls, then flows north-west, and about lat. 1° 40′ N. expands into Lake Ibrahim Pasha, discovered in 1874 by Colonel Long, one of the officers of Colonel Gordon, governor of the region of the White Nile. On again contracting to the dimensions of a river it flows first west then north-east to lat. 2° 15′ N., where it forms the Falls of Karuma. It then turns west, and after forming the Murchison Falls, enters, at the town of Magungo, another lake, the Mwutan Nzige, or Albert Nyanza, at an elevation of about 2550 feet. Magungo lies on the east side of the lake, close to its north-eastern extremity, and exactly at this latter point, about lat. 2° 35′ N. and lon 31° 22′ E., the river again leaves the lake, flowing in a northerly direction. Above Gondokoro, a town lying about lat. 5° N., the river forms a series of cataracts, and till 1876 the part of the river lying between these cataracts and the Albert Nyanza was never fully explored, so that there remained the possibility of doubting whether the stream which issued from that lake was the same with that which formed the cataracts above Gondokoro. But in that year the last vestige of doubt on this point was swept away. Under the direction of Colonel Gordon a steamer was carried in pieces round the cataracts to Dufile, and on the 7th of March Romolo Gessi started thence to sail up the river, and on the 18th of the same month he reached the Albert Nyanza. The whole of this part of the river, having a length of 164 English miles, he found to be navigable, deep, and broad, in many places with a breadth of upwards of 700 yards.

Not far below Gondokoro, which is nearly due north of the outlet of the Albert Nyanza, the Nile begins to flow more to the west till it reaches lat. 9° N., where it receives the Bahr-el-Ghazal, the most important of the tributaries that flow into it from the left bank. On receiving this affluent it turns due east for about 100 miles, and then after receiving the Sobat from the south-east, a very important river draining the country between Abyssinia and the Victoria Nyanza, flows almost due north to Khartoom. The united Nile turns first to the north-east, till at lat. 17° 30′ N. it receives its last tributary, the Atbara, from the Abyssinian frontier. From its junction with the Atbara the Nile flows north, having on the west or left bank the desert of Bahiúda; on the east Mekheyr, which is commonly called Berber. Lower down it forms several islands, one of which bears the name of Kandake (Candace), and also one or more cataracts, it then bends west by south, and passes by Jebel Barkal, where stand the remains of a temple, repaired by Tirhaka (700 B.C.), but probably 1000 years older. Resuming its northern course it enters the plains of Dongola, and forms several islands of great extent. Quitting these plains by a cataract the river flows through the districts of Mahas, Sukkot, Wadi Kenúz, and Batn-el-Hajar (or the Glen of Rocks), at the head of which is the second or great cataract, and entering Egypt at Philæ—the Pi-lakh or limit of the Egyptians—it descends the lowest (in ascending the first) cataract to Syene or Assouan, which is in lat. 24° 5′ N. From Philæ, lat. 24° 3′ N., the Nile flows through Egypt in a single stream as far as Batn-el-Bakara, the ancient Cercasorum, at the head of the Delta, in lat. 30° 15′, where it divides into two branches, leading down respectively to Rashíd (Rosetta) and Dimyat (Damietta), and entering the sea in about lat. 31° 35′ N. These two mouths correspond, as is supposed, to the Phatnitic and Bolbitinic mouths of the ancients, which, however, in ancient times were not so important as the Pelusian mouth on the east and the Canopic on the west, between which, proceeding from east to west, there were other five mouths, named respectively the Tanitic, Mendesian, Phatnitic or Bucolic, Sebennitic, and Bolbitinic.

As rain scarcely ever falls in the valley of the Nile from the 18th nearly to the 30th parallel, and very scantily even lower down, the river owes its supplies wholly to the copious rains of the countries wherein it rises. It begins to increase in June, attains its greatest height about the vernal equinox, and then subsides as gradually as it rose. The ordinary rise at Cairo is about 40 feet. During the flood a great portion of the Delta and of the valley of Egypt higher up, is inundated. In Sennaar also, and Dongola extensive tracts are watered immediately by the river; but, in general, the banks of the Nile above Egypt are irrigated by means of the water-wheel. In early times the case was different, as is shown by the composition of the soil formed of alluvial deposits in places no longer reached by the stream, even in its highest state of flood. The changes of level which have taken place in relation to the river are demonstrated by the fact ascertained by the Prussian expedition, that at Semneh, a day's journey beyond the second cataract, hieroglyphic inscriptions on the rocks attest that 4000 years ago the average height of the Nile at its utmost flood was 23 feet higher than at the present day, whilst inversely the yearly inundations of the river in Egypt are continually raising the level of the whole surrounding valley.

In the sacred language of the ancient Egyptians the Nile was called *Hape* or *Aur-Aa* (the Great River); in Coptic, *Jaro;* and in Hebrew, *Jar* or *Jaur*. The Greek *Neilos* has been derived from the Semitic *Nahar;* the designation of the river in Homer is the same as that of the country—*Aiguptos* (Egypt). The modern Arabs call it *Bahr*, and also *el-Nil*, while the Nubians term it *Tossi* or *Nil-Tossi*, the latter term being more especially used to designate the stream at its full height in the flood season.

The Nile received divine honours from the Egyptians, and at a later period also from the Greeks and Romans. By the Egyptians he was represented as a hermaphrodite, with a beard and woman's breasts, and a skin of a blue colour. The Upper Nile was distinguished from the lower by a peculiar floral symbol. The Nile had a temple dedicated to himself at Nilopolis, and his principal festival is men-

tioned under the name of Nilus. In Greek and Roman art he is depicted in the attitude of a river god reclining, around whom sport sixteen children, an allegorical representation of the height in cubits of the inundations of the river.

NILOMETER, a graduated column planted in a kind of well on the island of El-Rodah in Egypt, and intended to measure the height of the inundations of the Nile.

NIMBUS. See CLOUD.

NIMBUS, in painting, the halo or collection of rays with which artists surround the heads of sacred persons, in Christian art, of Christ, and the angels and saints. The use of this ornament is both ancient and wide-spread, being exemplified in the Indian, Egyptian, Etruscan, Greek, and Roman religions, as well as in Catholic Christianity. The ancient poets speak of their dieties as being crowned with such a nimbus in their occasional appearances on earth, and in paintings this nimbus was represented in the same way as in the paintings of Catholic artists. Apollo and Diana especially were represented in this manner. Some of the Roman emperors also, as Caligula, Trajan, Marcus Aurelius, and others, are found on coins with the same ornament. The nimbus of Christian art is usually circular in form, but sometimes it is triangular; sometimes in the form of three rays, one proceeding from the summit of the head, and the other two from the sides, so that the three form three arms of a cross. The triangular nimbus symbolizes the Trinity; it is sometimes inclosed in a circle, which symbolizes eternity. The nimbus with three rays is also a symbol of the Trinity. Another form of the nimbus is that in which one of the common circular shape supports a cross. This form is restricted to persons of the godhead. An ornament like the nimbus surrounding the whole person is called an *aureo'la*.

NIMEGUEN. See NIJMEGEN.

NÎMES, or NISMES (*Nemausus*), a city of France, capital of the department of the Gard, 62 miles north-west of Marseilles. It is an episcopal see, and the seat of several departmental authorities. It is situated in a delightful plain, and is surrounded with boulevards, which occupy the place of the former fortifications. It contains some handsome public buildings, among which are the palais-de-justice, an hospital, and cathedral. The public walks are magnificent. The inhabitants are principally employed in manufactures, chiefly of silk and cotton goods, fancy and mixed, such as taffetas, shawls, scarfs, cravats, hosiery, &c. There are likewise numerous tanneries, dyeworks, silk, lace, thread, and other spinning mills. It has considerable commerce in wine, oil, essences, drugs, dye-stuffs, &c., and is the great entrepot of Southern France for raw silk. Nîmes, next to Rome, contains the greatest number of monuments of Roman grandeur: among them are the square house (*maison carrée*), an ancient temple, consecrated, according to different authorities, in the reign of Augustus, Antoninus Pius, or Marcus Aurelius, 76 feet long, 38 broad, and 42 high, with thirty beautiful Corinthian columns (it was repaired by Louis XIV., and again in 1820); the amphitheatre, a noble circus of the Doric order, the walls of which, composed of enormous masses of stone, united with admirable skill, and about 1200 feet in circumference, are in good preservation; the beautiful fountain of Diana, with its baths and trees; the temple of Diana in ruins; the ancient Tour Magne, on a hill outside of the city, the original destination of which is unknown; a magnificent aqueduct, now known as the Pont du Gard, consisting of three rows of arches rising above one another to the height of 180 feet; a fountain, called the Fountain of the Nymphs, situated in fine public gardens, where it bursts forth with great copiousness at the foot of a hill, and is received into a large reservoir, which was originally a Roman bath; and two ancient gates, the one called Porte d'Auguste, consisting of four porticoes, formed by a double arch and two side passages; and the other called Porte de France, consisting of a single arch flanked by two circular towers. Very fine mosaics have been found here, and numerous fragments of ancient buildings, with Greek and Latin inscriptions. Nîmes is supposed to have been built by a Greek colony, and was afterwards for about 500 years in the possession of the Romans. In the sixteenth century it became a stronghold of Calvinism, and suffered much during the civil wars. The treaty known as the Pacification of Nîmes, concluded here in 1629, granted freedom of worship to the Huguenots, but deprived them of their fortified towns. In 1815 it was the scene of religious violence, in consequence of the reaction of that period. Guizot, the historian, was a native of this town. Pop. in 1881, 63,552.

NIMROD, a valiant warrior, who, according to the Mosaic account, as interpreted in the ordinary system of chronology, lived before 2000 B.C., and is generally supposed to have been the first conqueror who substituted the monarchical yoke for the patriarchal independency of the nomadic tribes. Babylon and the monarchy of Nimrod were founded by him, and enlarged by the conquest of the towns (fortified tribes) of Erech (afterwards Orchoë, now Warka in Irak Arabi), Acad (afterwards Nisibis), and Calneh (now Niffer).

NIMRÛD. See NINEVEH.

NINEVEH, a celebrated ancient and ruined city, capital of the Assyrian Empire, in Asiatic Turkey, and in the pashalic of Mosul, on the left bank of the Tigris, along which, and opposite to the town of Mosul, it appears to have stretched for a distance of about 18 miles, with an average breadth of 12 miles, in the form of a parallelogram, containing an area of not less than 216 square miles. The first recorded notice of Nineveh is in Genesis x., where, after an enumeration of the descendants of Ham, including Nimrod, 'who began to be a mighty one in the earth,' and had the beginning of his kingdom at Babel, 'in the land of Shinar,' it is added, ver. 11, 'Out of that land went forth Asshur, and builded Nineveh.' The date of its foundation, as thus fixed, is, according to the usual chronology, 2347 B.C. From this date there is a perfect blank in its history for nearly 1500 years; but it is obvious that it must have continued to flourish and make vast progress, for about 865 B.C., when it is brought prominently forward in the book of Jonah, it is described as a 'great city,' 'an exceeding great city, of three days' journey,' a 'great city, wherein are more than sixscore thousand persons that cannot discern between their right hand and their left hand.' It remained the capital of Assyria till about 606 B.C., when it was taken and burned by the Babylonian Nabopolassar and the Median Cyaxares, after a protracted siege, which appears to have begun about 625 B.C. About thirty years after, Ezekiel (chap. xxxi.), in a passage remarkable for the richness of its eastern imagery, portrays its desolation, and brings it out in bold relief by contrasting it with its former splendour: 'The Assyrian was a cedar in Lebanon, with fair branches;' 'all the trees of Eden that were in the garden of God envied him;' but 'strangers, the terrible of the nations, have cut him off;' 'upon the mountains and in all the valleys his branches are fallen, and his boughs are broken by all the rivers of the land; and all the people of the earth are gone down from his shadow, and have left him.' The destruction, indeed, was so complete, and the information furnished by profane historians so scanty and

Painted ornament from Nimroud.

Vase of white Alabaster.

Painted ornament from Nimroud.

Bas-relief of a king placing his foot on the neck of a captive, from Nimroud.

Pottery from Tombs in Nimroud and Kalah-Sherghat.

Bas-relief of Assyrian Warriors hunting the Lion from N.W. Palace Nimroud.

Winged human-headed Bull, and winged Figure from a doorway in the wall surrounding Kouyunjik.

Front view of a winged human-headed Bull.

Colossal Lion, from the entrance to a small Temple, at Nimroud.

Part of a Temple as exposed to view in course of the excavations at Khorsabad.

Large Alabaster slab found in the ruins of Sennacherib's Palace Kouyunjik, representing the moving of a winged human-headed Bull from a vault to the top of an artificial mound. The King represented as superintending the operations, is supposed to be Sennacherib himself.

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defective, that several writers, without venturing directly to impugn the testimony of the sacred volume on the subject, were disposed to consider it highly overcharged. It was known that opposite to Mosul, and both along the left bank of the Tigris and to a considerable distance inland, on what was usually supposed to be the site of Nineveh, a series of vast mounds existed, and probably occupied the site, if they did not actually contain the remains, of its ancient structures; but no serious attempt was made to ascertain the fact till 1841, when M. Botta, shortly after his appointment as French consul at Mosul, commenced operations on Koyunjik, immediately opposite to that town. He had only obtained a few fragments of brick and alabaster, when, on information which promised a richer harvest, he removed to Khorsabad, about 12 miles to the north-east. It was in the spring of 1843 that he began his operations here, and he was soon rewarded by the discovery of an Assyrian edifice which had not seen the light for perhaps two thousand years. The attention of Mr. Layard, who had travelled much in the East, and was ardently devoted to the study of its antiquities, had previously been arrested by the mounds, and he had resolved to take the first opportunity of exploring them thoroughly; but his resolution was still slumbering when the discoveries of M. Botta aroused him. After surmounting many obstacles, and obtaining the necessary requisites, he resolved to make the lofty mounds of Nimrûd, situated about 18 miles S.S.E. of Mosul, in the angle formed by the Tigris and the confluence of the Greater Zab, the scene of his first operations. His success was immediate and complete. The excavations of the very first day put him in possession of a chamber lined with slabs, in good preservation, and covered with cuneiform or arrow-headed inscriptions, and his treasures continued ever after to multiply upon him. Among other things he discovered gigantic emblematic figures—winged bulls and lions, with human heads, and winged sphinxes, placed as guardians over the entrances of magnificent palaces. The fire by which the palaces had been destroyed has so calcined the stone and other materials of which they are composed that in many cases, on the least exposure to the air, they have crumbled to pieces, sometimes before even an accurate sketch of them could be obtained; and hence many objects interesting as works of art, and containing inscriptions in all probability still more interesting, have been seen only to be lost for ever. In other parts, and more especially in the north-west palace, where the fire has not so much affected the buildings, twenty-eight rooms, in excellent preservation, have been opened, and numerous bass-reliefs, figures, and ornaments, rich in information as to the state of art and progress of civilization at the period when they were made, have been exhumed. From Nimrûd Mr. Layard proceeded to Koyunjik, where he was, if possible, still more successful. In the course of a month nine chambers were explored, one of them 130 feet long by 30 feet wide, and equally rich with those of Nimrûd in bass-reliefs and inscriptions. In 1847 Mr. Layard, owing partly to the exhaustion of his funds for excavation, and partly to the state of his health, which had suffered much from his incessant exertions, returned to England; but in 1849, having been furnished with new funds, though with a far too niggardly hand, he resumed his labours both at Koyunjik and Nimrûd, which have continued to yield up their treasures as if they were never to be exhausted. Previous to Mr. Layard's labours the Assyrian antiquities of the British Museum were contained in a case about 3 feet square; they now form one of its largest, and, in some respects, one of its most valuable collections. The labours of Layard at Koyunjik were continued by Loftus and Hormuzd Rassam in 1853, and the excavations at Nimrûd were resumed in 1873 by G. Smith, who was commissioned to do so by the proprietors of the *Daily Telegraph*, and afterwards by the British Museum. Since the death of Mr. Smith in 1876 the excavations have again been conducted by Hormuzd Rassam, who has already made some important discoveries at Nimrûd, and at Balawat, about 9 miles north-east of Nimrûd. That some of these discoveries are remains of the ancient Nineveh is not doubted, but there is still some difference of opinion as to the identification of the various places where discoveries have been made. It is generally thought that the mounds opposite Mosul, called Koyunjik, Khorsabad, and Nebbi Yunus, may be identified with Nineveh, and many identify Nimrûd with the ancient Calah mentioned in Gen. x. 11. Others again would identify the modern Kalah-Shergat, a town on the Tigris, about 100 miles lower down than Mosul, with Calah, in which case Nimrûd would naturally be identified with Resen, the great city mentioned in Gen. x. 12, as lying between Nineveh and Calah. Layard himself even suggested that the ancient Nineveh may have extended over the whole of the space between the remains opposite Mosul and Nimrûd, 18 miles distant; and although this opinion now appears to be generally given up, it will not seem altogether incredible when it is considered that the Assyrian and Babylonian practice was to include numerous large parks and gardens within the city walls. A great number of the cuneiform inscriptions discovered have been deciphered by Sir H. Rawlinson and other scholars, and throw great light on the history of Assyria. Some remarkable confirmations of the Scripture narrative have been obtained. Not only are the names of individuals the same, but the *thirty talents of gold* which Scripture informs us that Hezekiah was forced to pay, is now proved to have been paid, by an inscription which is to all intents a voucher or receipt of Sennacherib himself. In Pl. CXXXIV. the reader will find representations of various sculptures, bass-reliefs, and other objects discovered in course of the excavations at Nineveh. See ASSYRIA and CUNEIFORM WRITING.

NINGPO, a town in China, in the province of Che-kiang, in a magnificent plain on the left bank of the Takia. It was opened to foreign trade by the Treaty of Nankin in 1842. It is surrounded by walls 5 miles in circuit, 25 feet high, and 15 feet wide at top, and, besides, has extensive suburbs outside. Though highly extolled by the Chinese as one of the most beautiful cities of the Celestial Empire, it consists of narrow filthy streets and one-storied houses, sometimes of stone, but mostly of brick. Its most remarkable edifice is a brick tower, formed of seven stories, and above 160 feet high, but now a mere ruin. Another boasted structure is the temple of Ma Tsupu. Shops and immense storehouses occupy the quarters near the river, while eating-houses and tea shops abound near the gates and in the suburbs. A medical hospital, opened by a missionary society in 1843, has been found very beneficial. The manufactures consist chiefly of silk and cotton goods, carpets, furniture, &c. The native trade is very extensive, but the imports from Britain have as yet been very limited. The principal exports are tea, silk, and raw cotton; and the principal imports, besides manufactured goods, sugar, and opium. In 1881 the total value of the imports, inclusive of treasure but exclusive of re-exports, was £2,603,595. The great bulk of the trade is carried on with the other treaty ports. Ningpo was taken by the British without resistance in 1841. Pop. estimated at 260,000.

NINIAN, or NINIAS, ST., a Christian missionary preacher, who spread Christianity among the Picts

in the beginning of the fourth century. He was ordained bishop of the Southern Picts by Pope Siricius in 394. It would appear that Ninian was not the first to preach Christianity, at least to the southern Picts, who are said to have received Christianity as early as the second century; but at the time of Ninian's mission the people had all or nearly all returned to paganism. Ninian selected Candida Casa, or Whithorn (Wigtonshire), as his chief seat, but prosecuted his labours in all parts of southern Scotland, and even as far north as the Grampians. He died in 432. His festival is the 16th Sept.

NINON DE L'ENCLOS. See L'Enclos.

NINTH, in music, an interval containing an octave and a tone. See Music.

NINUS, the fabulous founder of the Assyrian Empire, and of its capital Nineveh, apparently, like his son Ninyas, invented from the name of Nineveh. According to a tradition originally Persian, and directly contradicting historically authenticated facts, Ninus extended the Assyrian Empire to Egypt and India. He married Semiramis, by whom he was afterwards murdered. The whole fable of Ninus and Semiramis was spread by Ctesias of Cnidos. The more trustworthy Herodotus mentions only the better authenticated Semiramis, who appears to have lived about 800 B.C., while Ninus must be placed about 2000 B.C.

NIOBĒ, daughter of Tantalus (king of Lydia) and the Hyad Dionē, or according to other accounts the Pleiad Taÿgetē, was the wife of Amphion, who, in common with Zethus, governed Thebes, which they had built. According to the common accounts she had seven sons and seven daughters (according to Homer, six sons and six daughters), and, proud of her blooming offspring, she so far forgot herself as to exalt herself above Lēto (Latona), the mother of only two children—Apollo and Artemis (Diana); and in punishment of her presumption she had to witness the destruction of her children by the arrows of the twin deities. Anguish and despair transformed the wretched mother, after long wanderings, into a stone, which was shown on Mount Sipylus, in the kingdom of her father. Amphion and Zethus also fell, pierced by the arrows of Apollo, when, full of wrath, they penetrated into the sanctuary of the god. This is the most common account of the fate of Niobē, in the circumstances of which poets frequently differ, who have taken this story for a subject as often as artists. The origin of the fable seems to lie in the ancient figure of speech by which it was said of young people who died suddenly that they had been struck with the arrows of Apollo or Artemis; and in almost all languages, petrifaction is the natural image of the highest degree of torpid despair. One of the most beautiful exhibitions of ancient art is contained in the group of Niobē, which adorned the pediment of the temple of Apollo Socianus in ancient Rome. The statues forming this group were dug up in 1583 near the Porta Lateranensis in Rome, were purchased by the Cardinal Ferdinand de' Medici, who caused them to be placed in the villa Medici, and in 1772 were conveyed to Florence by the Grand-duke Leopold, where they still remain. After their removal thither they were restored by Vincenzo Spinazzi. The group consists of fourteen statues, representing Niobē and thirteen of her children. Respecting its author nothing certain is known; some, with Pliny, attributed it to Scopas; others to Praxiteles: Winkelmann declared himself for Scopas. Equally ignorant are we respecting the original combination of the single figures. It has hitherto been the more difficult to form an opinion inasmuch as several of them, the 'two wrestlers,' as they are termed, the pedagogue (whom Fabbroni takes for King Amphion), and one of the daughters (whom Goethe thinks an Erato), have been pronounced by the best connoisseurs not to belong to this group, although they were all found in one place and at the same time.

NIOBIUM. In 1801 Hatchett obtained a new metal from a mineral called columbite; to this metal the name columbium was given. A few years later this metal was examined by Wollaston, and by him it was said to be identical with the metal tantalum. H. Rose, in 1846, showed, however, that these two are distinct elementary bodies, and to the columbium of Hatchett he gave the name niobium.

The metal niobium is said to be obtained by heating the double fluoride of niobium and potassium or sodium, along with sodium, in a covered iron crucible; it is a black powder; specific gravity, 6·27 to 6·67. It combines energetically with oxygen and with chlorine. There seems to be a doubt as to whether this black powder is metallic niobium or an oxide of the metal. The oxide Nb_2O_5, the chloride $NbCl_5$, and the oxychloride $NbOCl_3$, are substances whose formulæ are well established.

NIORT, a town in France, capital of the department of Deux-Sèvres, on two hills washed by the Sèvre-Niortaise, 79 miles south-east of Nantes. Its town-house was once the palace of Eleonora of Aquitaine, queen of Henry II. of England, and it has an old castle in which Madame de Maintenon was born. The staple manufactures are leather and gloves, especially the latter, of which great numbers are exported, principally to the United States. The trade, particularly in claret, is extensive, Niort being the entrepôt for the surrounding country. It has frequently been besieged, taken, and retaken. Pop. (1881), 22,254.

NIPHON. See Japan.

NIPPLE. See Mammary Glands.

NIRVANA. See Buddha.

NISÀMÎ (full name, Abu Mohammed Ben Jusuf Sheich Nisàm-ed-dîn), one of the seven great poets of Persia, and the founder of the romantic epic, was born about 1100 A.D. in the town of Genje, and was a special favourite of the Seljuk princes, who then ruled in Persia. He died at an advanced age in 1180. Besides a Divan, or collection of lyrics, he wrote five larger poems, on which his poetic fame rests, and which in Persia are regarded as masterpieces which no subsequent attempts have been able to equal. These poems are—1, Machsen ul-errâr, that is, Magazine of Secrets, a didactic poem, in which theoretical doctrines as to ethics alternate with historical details, anecdotes, and fables; 2, Chosrau u Shirin, a romantic epic, which has for its subject the love of the Persian king Chosru for Shirin; 3, Mejnun u Leila, which describes the love of Mejnun, a son of the Arabian desert, for the beautiful Leila; 4, Hest-peiger, or the Seven Forms, a collection of seven novels in a kind of poetical heptameron. The most famous of these tales is the fourth, called Turandocht, which, after being subjected to various changes, furnishes the materials of Gozzi's and Schiller's well-known dramas; 5, Iskender-nâme, a traditional and embellished history of Alexander the Great, taken from the Greek poem on that subject by the pseudo Callisthenes. These five poems, called Chamse, have been repeatedly printed and lithographed in Persia and India, and very extensively circulated.

NISH, or Nissa, a fortified town in European Turkey, on the Nissava, capital of a liva in the vilayet of Kossovo. It is the seat of a Greek bishop, has two forts, and celebrated hot-springs and baths. It was anciently called Naissus, and was the native place of the Emperor Constantine the Great. Pop. 10,000.

NISHAPUR, an ancient city in Persia, in the province of Khorasan, 50 miles west by south of Mushed. It was destroyed by the Tartars in the middle of the twelfth century, and has never since recovered its former prosperity. Its ruins are said to cover a space 25 miles in circuit. Mines producing the finest turquoises in the world have long been worked in its vicinity. Pop. about 15,000.

NISIBIS, also called ANTIOCHIA MYGDONIÆ, anciently an important town in Mesopotamia, in the district of Mygdonia, on the river Mygdonius. It is now the town of Nisibin, in Turkey in Asia. It was frequently taken and retaken in the wars between the Romans and the Parthians, and afterwards between the Romans and Persians, until it was at last given up to the latter by the Emperor Jovian in 363. The Persians were here defeated by Belisarius in 541, and by Marcian in 573.

NISI PRIUS. Trial at *nisi prius* is a name often given in England to trial by jury in the superior courts. The term originated in the English courts in the following way: Questions of fact in all causes commenced in the courts of Westminster Hall are, by course of the courts, appointed to be tried on a day fixed in some Easter or Michaelmas term by a jury returned from the county wherein the cause of action arises, but with this proviso, *Nisi prius justiciarii ad assisas capiendas venerint*, that is, unless before the day fixed the judges of assize come into the county in question, which they always do in the vacation preceding each Easter and Michaelmas term, and there try the cause; and then, upon return of the verdict given by the jury to the court above, the judges there give judgment for the party for whom the verdict is found. The commission under which these judges of assize act is called a 'commission of *nisi prius*,' and as the jury trials take place before them while the judges in Westminster Hall settle questions of law, these jury trials are called 'trials at *nisi prius*.'

NISMES. See NIMES.

NISUS, in ancient Greek legend, King of Megara, the son of Pandion, king of Athens, and Pylia. He had a purple or golden lock of hair on which his own life depended. When Minos, on his expedition against Athens, laid siege to Megara, Scylla, the daughter of Nisus, having fallen in love with him, deprived her father of his lock of hair and gave it to him. On this Minos gained possession of Megara, but punished the traitress by tying her to the stern of his ship and drowning her in the Saronic Gulf. According to others she leaped into the sea and swam to the ship of Minos, who abandoned her in disgust. While she here saw her father changed into a sea-eagle and ready to pounce upon her, she was herself changed into a species of sea-bird called Ciris.

NITRATES, salts of nitric acid. See NITROGEN.

NITRE, the ordinary name for potassium nitrate. See POTASSIUM.

NITRIDES. This name is used as a general designation for the compounds of nitrogen with other elements or radicles, but more especially for those compounds which nitrogen forms with phosphorus, boron, silicon, and the metals. The general formulæ for the nitrides are RN, R_2N, and R_3N, in which R represents a monatomic element. The nitrides are generally formed (1) by the action of ammonia upon metallic oxides or chlorides; or (2) by the direct action of atmospheric nitrogen on metals at the moment of their separation from their oxides by the action of charcoal. Reference must be made to the various articles on the metals, &c., for a description of the individual nitrides.

NITRILES. Certain of the compounds of cyanogen (which see) with alcoholic radicles are classed together under the general name of nitriles. These bodies may be represented by the formula CNR, in which R represents a monatomic alcoholic radicle. The nitriles may be prepared (1) by dehydration of the ammonium salts of those acids which contain the corresponding alcohol radicles, thus—

$$\underset{\text{Ammonium Acetate.}}{C\begin{cases}CH_3\\O\\ONH_4\end{cases}} - 2H_2O = \underset{\text{Acetonitrile.}}{C\begin{cases}CH_3\\N\end{cases}};$$

or (2) by the action of potassium cyanide upon an alcoholic iodide, &c., thus—

$$KCN + C_2H_5I = KI + C_2H_5CN$$

These bodies may be regarded as ethers of hydrocyanic acid HCN (which see). It is generally believed that the alcoholic radicle in the nitriles is in direct union with the carbon atom. In accordance with this hypothesis the general formula for these substances is written thus, $C\begin{cases}N\\R\end{cases}$; now it is evident that a series of bodies may exist the general empirical formula of which is also CNR, but in which the nitrogen forms the central or dominant atom in the molecule, and whose rational formula, therefore, is $N\begin{cases}C\\R\\R\end{cases}$. Such a series of bodies does exist, and to this series the general name of *carbamines* is applied.

The best known nitriles belong (1) to the series $C_nH_{2n-1}N$, among which are included *acetonitrile* (or methyl cyanide) C_2H_3N, *propionitrile* (or ethyl cyanide) C_3H_5N, &c. &c.; and (2) to the series $C_nH_{2n-7}N$, the principal of which is *benzonitrile* (or phenyl cyanide) C_7H_5N.

NITRITES, salts of nitrous acid. See NITROGEN.

NITRO-COMPOUNDS. Those compounds of carbon which are formed from others by the substitution of the monatomic radicle NO_2 for hydrogen are classed under the general name of nitro-compounds.

NITROGEN is the name given to a colourless, invisible gas, which exists in large quantities in the atmosphere. To this substance Lavoisier gave the name of *azote* (Greek, *a*, privative; *zōē*, life), because it is incapable of supporting life. The name by which this gas is now known was applied to it by Chaptal, because of its entering into the composition of nitre, nitric acid, &c. The atmosphere contains about one-fifth of its volume of nitrogen, nitre contains nearly 13 per cent., and nitric acid about 22 per cent. by weight of this substance. In the air-bladders of fish nitrogen also exists in the free state, while in combination with other elements it constitutes many minerals, and a great diversity of animal and vegetable substances. From the great storehouse of nitrogen—the atmosphere—this gas may be obtained very readily. It is only necessary to remove the oxygen, which may be done by burning such a substance as phosphorus in an inclosed space of air, or by passing air over heated copper. From the other storehouse of nitrogen, namely, nitre, it is not so easy to procure the gas; we must first of all form a nitrogen salt of potassium containing less oxygen than nitre, namely, potassium nitrite, and then by heating this with salammoniac, nitrogen is evolved. Animal matter, such as flesh, muscle, &c., when treated with nitric acid, evolves nitrogen gas. The action of the living organism also produces this gas, which is contained in air expired from the lungs, a fact noticed by Rutherford in the year 1772. Nitrogen is a colourless, inodorous, tasteless, uncondensable gas, which has a specific gravity of 0·972. It is a very inert substance in itself, although many of its compounds, such as nitric acid and ammonia, are possessed of great chemical activity. Nitrogen is

incombustible, nor does it support combustion. It is not directly poisonous, yet it is incapable of supporting life, inasmuch as it cuts off the entrance of the life-supporter oxygen. By reason of its inertness and general slowness of chemical action it acts the part of a diluent of oxygen in the atmosphere. Having no marked action of its own on living beings, its admixture with the oxygen of the air serves to moderate the otherwise too violent action of this latter gas. Under certain circumstances nitrogen may be induced to combine with other elements, especially with hydrogen, oxygen, and carbon, with titanium, tantalum, and tungsten. This gas, nitrogen, is allied in many of its chemical properties to the other elementary substances—phosphorus, arsenic, antimony, and bismuth; it has the power of combining with one, three, or five atoms of a monovalent element or radicle, and its atomic weight is 14.

NITROGEN, OXIDES AND OXIACIDS OF. The oxides of nitrogen are a very interesting series of bodies, five in number. It is by looking at these substances as a series rather than by regarding each of them in detail that their interesting nature is chiefly brought to view. The first oxide of nitrogen contains 28 parts by weight of nitrogen united with 16 parts by weight of oxygen; its chemical formula is N_2O. The next oxide contains 28 parts by weight of nitrogen united with 32 parts by weight of oxygen; its formula is N_2O_2. In the third oxide the same amount of nitrogen, 28 parts, is united with 48 parts of oxygen, and to it the formula N_2O_3 is assigned; while the fourth and fifth oxides contain respectively 64 and 80 parts of oxygen, united in each case with 28 of nitrogen; to these the formulæ N_2O_4 and N_2O_5 are given.

Now why is it that in these oxides the amount of oxygen increases by multiples of 16? Why do we have either 16, or twice or three times 16, parts of oxygen combined with the same amount of nitrogen? Why is it not possible to form an oxide of nitrogen which shall contain 16 plus the half or fourth of 16 parts of oxygen in union with 28 parts of nitrogen? Questions such as these led John Dalton to his famous atomic theory (which see), which supposes that the atom, or smallest chemically indivisible part of oxygen, weighs, relatively to hydrogen as unit,—16, also that chemical combination takes place atom with atom; hence it is impossible to have any compound containing a fraction of an atom, that is, in the case before us, any fraction of 16 parts by weight of oxygen. These oxides of nitrogen may be all produced from nitric acid. The highest oxide, N_2O_5, called *nitrogen pentoxide*, is formed by the action of dehydrating substances, notably phosphorus pentoxide (the white substance produced by burning phosphorus in air), on strong nitric acid, $2HNO_3 - H_2O = N_2O_5$. This oxide forms colourless, transparent crystals, which melt at 30°, and boil a little above 45°. From its great avidity for water it is somewhat difficult to prepare this body. The next lower oxide (N_2O_4), called *nitrogen tetroxide*, may be produced by forming the lead salt of nitric acid and heating this salt in a glass retort, when red fumes are evolved, which may be condensed by cold, forming thereby a nearly colourless liquid. When cooled to −9° this liquid solidifies, and we thus obtain colourless, transparent prismatic crystals. When the liquid is heated its colour gradually changes to darker and darker red, until it finally becomes very dark. These changes are probably accompanied by a decomposition of the molecule N_2O_4 into two molecules, each represented by the formula NO_2.

The *trioxide* (N_2O_3) is produced, although not unmixed with other oxides, when nitric acid is heated with starch and the dense red fumes are led into a tube surrounded with a freezing-mixture. This oxide forms a dark blue liquid, which, when added to water at 0°, combines therewith, forming *nitrous acid*, HNO_2. This solution acts as a reducing agent, inasmuch as it eliminates gold and mercury as metals from several of their salts; on the other hand, it also exercises an oxidizing action on such salts as ferrous sulphate, potassium iodide, &c. By replacement of the hydrogen in nitrous acid a series of metallic salts is obtained, called *nitrites*. These nitrites have the general formula MNO_2, where M represents a monovalent metal. Nitrites, especially ammonium nitrite, are met with in nature; they are produced by the partial oxidation of nitrogenous substances. When pure water evaporates into the atmosphere it takes up a small quantity of nitrogen, and forms thereby ammonium nitrite, thus $2H_2O + N_2 = NH_4NO_2$.

The next lower oxide of nitrogen, namely, *nitrogen dioxide* (N_2O_2), called also *nitric oxide*, is produced by acting on copper with nitric acid diluted with its own bulk of water. Nitrogen dioxide is a colourless, permanent gas. With oxygen this substance forms the trioxide, thus $N_2O_2 + O = N_2O_3$, hence whenever nitrogen dioxide is brought into contact with air red fumes (nitrogen trioxide) are produced.

The last oxide, *nitrogen monoxide*, has the formula N_2O; it is better known by the name of 'laughing-gas,' from the peculiarly exhilarating effect which it produces when breathed along with a little air. If the gas be pure, its inspiration soon brings about total insensibility, which does not continue long, and generally produces no bad effects upon the person who breathes it, hence it is much used as an anæsthetic in minor surgical operations, such as teeth-drawing, &c. For the use of the dentist the gas is generally liquefied by pressure, and stored in thick iron cylinders, from which, when opened at ordinary temperatures, a copious stream of gas is obtained. Nitrogen monoxide is prepared by heating the ammonium salt of nitric acid, thus—

$$NH_4NO_3 = N_2O + 2H_2O.$$

An acid corresponding to this oxide, and called *hyponitrous acid*, is known. It may be regarded as the product of the action of water on the oxide; $N_2O + H_2O = 2HNO$, in the same way as nitrous acid is the product of the action of water on the higher oxide, namely, the trioxide, $N_2O_3 + H_2O = 2HNO_2$, and as nitric acid is the product of the same action in the case of nitrogen pentoxide, $N_2O_5 + H_2O = 2HNO_3$.

This last-named acid—nitric acid—we have now to consider.

Nitric acid has the formula HNO_3. By distilling nitre (potassium nitrate) or Chili saltpetre (sodium nitrate) with strong sulphuric acid nitric acid is obtained, $KNO_3 + H_2SO_4 = KHSO_4 + HNO_3$. The sodium salt is more generally employed by the manufacturer, because 85 parts by weight of this substance produce as much of the acid as 101 parts of nitre, the amount of sulphuric acid required being the same in both cases. This process is almost identical with that by which Glauber obtained the acid in the seventeenth century. As the process proceeds a yellow, or sometimes reddish yellow, liquid is found in the receivers. This liquid is nitric acid mixed with oxides of nitrogen; from these oxides it may be freed by blowing a current of air through it. When pure, nitric acid forms a mobile, colourless liquid which fumes strongly in the air, is very acid, burns the hand, staining the skin yellow, and absorbs moisture from the air. When cooled to −55° it becomes thick and semi-solid. When heated it undergoes gradual decomposition, until at 260° it is entirely broken up into water, nitric oxide, and oxygen.

Nitric acid contains about 76 per cent. of oxygen,

a great part of which it readily gives up to other substances, acting thus as a powerful oxidizer. Thus many metals—such as copper, tin, silver, &c.—when brought into contact with this acid, are oxidized at the expense of the acid, with the production of lower oxides of nitrogen and an oxygenated metallic salt. Similarly, if turpentine be dropped into very strong nitric acid the carbon and hydrogen of the turpentine are oxidized so energetically that light and heat are produced. Nitric acid, when moderately dilute, acts on organic bodies so as to produce a series of most useful substances, notably acetic, oxalic, and picric acids, isatin or white indigo, &c. When strong acid is used, nitro-compounds oftentimes result, containing the group NO_2 in place of part of the hydrogen of the original substance; thus we get *nitrophenol*, *nitrobenzene*, &c.

By replacement of the hydrogen in nitric acid a series of salts termed *nitrates* is obtained, which may be represented by the formulæ MNO_3 and $M_2(NO_3)_2$, where M stands for a monovalent metal. Many of the nitrates are much used in the arts; they are generally crystalline substances, easily soluble in water. These salts decompose when strongly heated, at first generally evolving oxygen, and, as the temperature rises, nitrogen tetroxide or trioxide. When nitrates are heated with combustible bodies an explosion is generally produced.

For a description of the different metallic nitrates reference must be made to the articles on the various metals.

A mixture of strong hydrochloric and nitric acids is known as *aqua regia*, *nitromuriatic*, or *nitrohydrochloric acid;* it is much used as a powerful oxidizing substance; its action depends chiefly on the chlorine and chloride of nitrosyl (NOCl) which it evolves. These substances readily decompose water and evolve oxygen, which in this so-called *nascent state* is very powerful in its action.

In addition to these oxi-derivatives of nitrogen a series of haloid derivatives are known, produced by the action of iodine, chlorine, or bromine upon compounds of nitrogen, especially upon ammonia. These substances are extremely explosive, a few drops of nitrogen chloride being sufficient, when exploded, to shatter the entire contents of a large room. They have not, as may be expected, been much studied; the formulæ NCl_3 and NI_3 are usually assigned to the chloride and iodide respectively.

NITROMURIATIC ACID. See Aqua Regia under Nitrogen.

NITROPHENOL. See Phenol.

NITROSO-COMPOUNDS. The action of nitrous acid upon carbon compounds gives rise in many cases to the formation of bodies in which hydrogen is replaced by the monatomic radicle NO; these bodies are generally known as nitroso-compounds. This reaction seems to depend chiefly upon the presence, in the carbon compound, of the group NH (*imidogen*); it may be thus formulated—

$$R.NH + NO.OH = HOH + RN.NO.$$

NITROSYL. The group NO, when existing in combination with other elements, is called nitrosyl. Nitrosyl is capable of combining directly with chlorine to form the compound NOCl. The compound $NOCl_2$ is said to be produced when the gaseous products of the distillation of a mixture of 1 part of strong nitric acid and 3 parts of hydrochloric acid are passed through a U tube surrounded by a freezing mixture.

NITROTOLUOL. See Toluol.

NIZZA. See Nice.

NOAH, one of the patriarchs of the Old Testament, son of Lamech, is described in the book of Genesis as being chosen by God for his piety to be the father of the new race of men which should people the earth after the deluge. We read nothing of him from his birth till he is 500 years old, when we are told that he begat three sons, Shem, Ham, and Japheth. Having been warned by God of the coming flood, he built a vessel by the direction of Jehovah, into which he entered with his family and all kinds of animals. (See Deluge.) After the waters had subsided from the earth the vessel which contained the progenitors of all living creatures rested on Mount Ararat in Armenia, where Noah offered a thank-offering to God, and was assured that the earth should never again be destroyed by a flood. As a sign of this covenant with Noah, God set the rainbow in the clouds. Permission was now granted to the human race to eat flesh, provided they did not eat it raw with the blood; and murder was declared punishable by death. Noah then began to cultivate the earth, and planted a vineyard, and having made wine, became intoxicated. While under the influence of the wine his son Ham ridiculed the exposure of his father, while his other sons, Shem and Japheth, reverently covered him with a garment. When the patriarch awoke, and was aware of what had taken place, he gave his blessings to the filial piety of the latter, and pronounced a curse of servitude upon the posterity of the former. Noah died at the age of 950 years, 350 years after the flood.

NOAILLES, one of the oldest noble families in France. Among the members of this family, which were invested with the first offices under the old *régime*, were Antoine de Noailles (1504–62), celebrated on account of his embassies under Henry II. The Abbé Vertot has published an account of them. His brother, the Bishop of Dax (1519–85), was also employed on several important and difficult diplomatic missions to England, Italy, and even Constantinople.—Anne Jules, Duke of Noailles (1650–1708), inherited from his father the first company of the *gardes-du-corps*, and in the war of 1689–97 commanded a *corps-d'armée* in Catalonia; in 1693 was made marshal, and in 1694 gained the battle of the Ter against the Spaniards.—Louis Antoine de Noailles (1651–1729), brother of the preceding, Archbishop of Paris and cardinal. On account of the aid which he afforded to Quesnel he was persecuted by the Jesuits, and especially by Le Tellier, the confessor of Louis XIV. They prevailed on the pope to issue the bull Unigenitus, which was resisted by Noailles as archbishop of Paris till he was finally compelled to yield in his seventy-eighth year. He died soon afterwards in 1729.—Adrien Maurice, Duke of Noailles (1678–1766), son of the above-mentioned Anne Jules, served with distinction in Spain in the Spanish war of Succession, was created grandee of Spain of the first class, and in 1698 married Françoise d'Aubigné, a niece of Madame de Maintenon. During the minority of Louis XV. he was president of the council of finance and member of the council of regency, which he left, however, in 1721, rather than concede the presidency to Cardinal Dubois. He was exiled by the influence of Dubois, but after his death he was recalled and reinstated in his former offices. In 1734 he served under Berwick in the campaign on the Rhine, and at the siege of Philipsburg received the marshal's staff. In the following year he commanded the French army in Italy. When the Austrian war of Succession broke out after the death of the Emperor Charles VI. Noailles received a command on the Rhine. In 1743, by the unseasonable impetuosity of his nephew the Count of Grammont, he lost the battle of Dettingen. His age no longer permitting him to fight at the head of armies, he entered the ministry. His friendship for Marshal Saxe induced him, although an

elder marshal, to serve under him in the battle of Fontenoy. He was ambassador to Madrid from April to June, 1746.

In later times the following members of this family have rendered themselves distinguished:—Louis Marie Antoine (1756–1804), Viscount of Noailles, a general, and member of the first national convention in 1789. After the dissolution of the Constituent Assembly he went into the army, and in 1792 commanded the chain of outposts at Valenciennes. His birth subjected him to suspicion; he demanded his dismissal, and lived in retirement in the country. Under the consular government he returned to the service, and gained distinction in St. Domingo as general of brigade under Leclerc and Rochambeau. After the evacuation of the island he embarked on board a vessel of war for Cuba, but was killed in a fight with the British, who took the vessel.—His son Alexis, Count of Noailles (1783–1835), minister of state of Louis XVIII., was obliged to leave France in 1811. In 1813 he served under the Crown-prince of Sweden in Germany. He acted as the plenipotentiary of Louis XVIII. at the Congress of Vienna. He returned with the king from Ghent to Paris, was chosen deputy of the chamber of 1815, and in October of the same year was appointed by Louis minister of state, but without any particular department. In 1828 he was a member of the chamber of deputies, and was appointed by the king member of the commission to examine whether the schools of the clergy accorded with the principles of the French constitution.

NOBILITY, a rank of society which possesses honours and privileges above the rest of the citizens. A hereditary nobility is found in the infancy of almost every nation, ancient and modern, for there is in society a natural tendency to inequality of condition. Its origin is to be attributed to various causes: for the most part to military despotism; in some cases to the honours paid to superior ability or to the guardians of the mysteries of religion. The priestly nobility of the remotest antiquity has everywhere yielded to the superiority of military chieftains. Among the ancient Romans the citizens were at first either *nobiles* or *ignobiles*, that is, patricians or plebeians; but a new order of nobility arose out of the plebeians, the descendants of those who had held curule magistracies being entitled to exercise the *jus imaginum*, or right of having images of their ancestors—a distinction corresponding to the modern one of having coats-of-armour. Among the ancient German tribes only obscure traces of hereditary nobility are found, which in later periods was generally established throughout the Continent. Many of them seem, however, to have recognized one ruling family. Besides these, no other hereditary nobility existed among the Franks, Saxons, Normans, Danes, Swedes, and most of the other nations of the north. The *Athelings* of the Saxons are exclusively members of the reigning house, and the same name frequently denotes only the successors to the throne. The dignities of the counts of the Franks, the aldermen and great *thanes* of Britain, as also of the *jarls* (in England *Eorlas*) of Denmark, were accessible to every one distinguished by merit and favoured by fortune. In France and Germany the first hereditary nobility begins with the downfall of the Carlovingian dynasty; in England with the important conquest of the Normans in the eleventh century. (See Britain—The Civil State.) It was afterwards spread over all Europe, for since that time dignities as well as lands have become hereditary. Under various forms and combinations the nobles of the first rank (as princes, counts, and lords), together with the warriors (consisting of *knights* bound to do service in war and at the court), which latter were not always considered as perfectly free, were distinguished from the peasants and common citizens, who were bound to perform the common laborious services. The further progress of these civil distinctions and their relations to the people took a very different course in the different countries of Europe. In England hereditary nobility, including various classes of titles, for example, those of dukes, marquises, earls, viscounts, and barons, is personal. In Spain and Italy, on the other hand, the same rank (that of the *titulados*—princes, dukes, marquises, and counts) depends in a greater measure upon property, for these titles, though sometimes conferred by the monarchs, are mostly connected with estates, and often attached to very small fiefs; hence the multitude of counts in Upper Italy, the *conti di terra ferma* of Venice in former times. The distinguished Spanish families collect in this manner a great number of such titles, which constitute an object of their pride. In France nobility is common to all the members of the noble family. The rights of the peerage and the feudal estates, however, descended, even before the revolution, only to the eldest son; and the younger sons usually sought their fortune either in the army or the church. Every meaner employment, even mercantile business, was followed by the loss of nobility; but this was not the case in England or Scotland. The nobility of England has never risen to sovereignty, except that some provinces which formerly were domains of princes of the royal family (as Lancaster, Cornwall), and some viscounties (Durham, Chester, the Isle of Ely, and especially the Isle of Man, belonging to the dukes of Athol), enjoyed, as *counties palatine*, so called, subordinate rights of government. The sovereignty connected with the ancient fiefs of the French princes—as the dukedoms of Normandy, Bretagne, Guienne, Burgundy; the counties of Toulouse, Champagne, Flanders; and the territories of Dauphiné, Provence, Franche-Comté, Venaissin, &c.—took its rise at a very early period, and had already become complete when Hugh Capet ascended the throne. But France was fortunate enough to unite by degrees all these extensive fiefs with the crown, so that only a few small sovereignties (as the princedoms of Bouillon, Dombes, Orange, Avignon, Venaissin, and a few more) maintained themselves as such to more recent periods. In the age of Louis IX. appeals from the courts of the barons to the supreme courts of the king and parliaments were introduced, and were followed by a gradual extension of the king's authority over the territories of the barons; and finally, under the reign of Louis XIII. the power of the grandees was completely destroyed by Richelieu. The course which the nobility took in Germany was different. Here the ancient Dukes of Saxony, Bavaria, Franconia, Suabia, Lotharingia, and, next to them, the margraves in the east and north of the German Empire, obtained at the same time as in France the rights of sovereignty; and the title of *count* became partly hereditary, partly an appendage to the ecclesiastical establishments. The emperors succeeded in annihilating these ancient principalities, but profited little by it, for new sovereignties soon took the places of the ancient dukedoms, inferior in size and power, but equal to them in the extent of their rights and privileges. The greater number of the counts assumed the rights of sovereignty, and a vast number of ruling families thus sprang up in Germany, and formed a ruling order of nobility, in which not only the rank but also the property was hereditary, and became the common inheritance of the whole family. In Germany it was a recognized principle that the mother must be of equal rank with the father in

order to place her children in the full possession of their father's rights. Many even princely families, as Baden, Anhalt, &c., have transgressed this principle; but others adhered to it with great strictness. The same principle has been extended to the lower class of the German nobility. In their case, however, it affects only the enjoyment of certain privileges common to the whole body of nobility—privileges by which the German nobility is more strictly distinguished from the middle classes of freemen than that of any other country. In the rest of Europe not even the highest class of nobility recognizes this principle. In France the royal alone afforded no example of a marriage contracted with persons of a lower rank, though the law would not have interfered. The legitimated branches of the royal family, the offspring of mistresses, the princes of Vendôme, Verneuil, Vermandois, Maine, Toulouse, Penthièvre, &c., which are now extinct, Louis XIV. did not hesitate in his will to recognize as capable of succession to the French throne in spite of their descent not merely from parents of unequal rank but even from an illegitimate connection; and the same right could never have been contested in regard to children of a legitimate connection between parents of unequal rank. In the noble families of France the rank of the mother was likewise of no consequence; the whole importance of the family rested on the lineage of the father. The same is the case in England, where intermarriages between the families of ordinary citizens and the highest nobility are not uncommon. Similar examples may be found in other countries. In Germany alone the interests of the kindred of princes as well as the exclusive claims of the nobility to the chapters and prebends of the ecclesiastical orders have produced those rigid principles above-mentioned. Germany is likewise the only country which affords an example of a select nobility composed of reigning families and princes, who, besides the right of sovereignty over their own territories, had a part in the government of the empire by their seat and vote in the diet, or at least a share in the collective vote of the prelates or of the four bodies of counts, for some rights of sovereignty belonged also to the knights of the empire who did not belong to the select nobility. The limits of this select nobility were extremely uncertain and contested, though very important to be settled, on account of the restrictions on the marriage of its members. The rank of the select nobility was partly personal, partly hereditary. The former was attached to ecclesiastical princes, bishops, and abbots, many of whom were at the same time actual sovereigns; but many possessed only the dignity of princes of the empire without the rights of sovereignty. In most of these ecclesiastical principalities the German nobility had excluded untitled men of learning and talent against the will of the pope and his express order promulgated in the Treaty of Westphalia. The highest degree of hereditary nobility was peculiar to the families of the princes and counts of the empire, and confined to Germany. It is true many French, Italian, Spanish, and English families had the title of princes, dukes, and marquises (English dukes and marquises are also called *princes* in official documents), but the German princes considered few of them as their equals. To this class belong in France those six foreign families which enjoyed at the French courts the rights of *princes étrangers* on account of their relationship with sovereign houses or on account of their descent from former sovereigns of Bretagne and Aquitania. These families in France were those of Lotharingia, Savoy, Grimaldi (princes of Monaco), Rohan, Latour d'Auvergne (dukes and princes of Bouillon). Some Polish families belonged also to this class, as the Radzivills, Czartoryskis, &c. In Sweden and Denmark a select nobility of this kind has never existed. Though many German families of this rank had lost their sovereignty, yet the act of the German Confederation conceded to them the highest rank of nobility, equal to that of the sovereign houses. There was still a strict distinction in Germany between the ancient princes who had risen to this dignity before 1580 and those of a more recent date. The more, however, the power of the German principalities increased the more the importance of the nobility decreased. On this account a society was formed in 1815 called the *chain of nobility*, for the purpose of restoring and promoting the interests of the nobles; but it met with little success. The nobility of France under the restored Bourbons, and during the first part of the reign of Louis Philippe, were of two classes—the titular only, and those both titular and legislatorial; the latter formed a majority in the *chambre des pairs*. The British nobility composing the House of Lords consists of five ranks—duke, marquis, earl, viscount, baron. The Russian nobility, though its origin is not directly derived from Germany, has appropriated to itself all its degrees and titles. Nobility was very early conferred by patent. As soon as the nobles had assumed the character of a distinct rank in the state the monarchs also availed themselves of their right of conferring degrees of nobility, and insisted upon the principle that in a monarchy no privilege could be more ancient or could have any other origin than the prerogative of the monarch himself. Philip III., therefore, first began (1271) to grant charters of nobility in France, and Germany soon followed his example. The degrees of the lower nobility in Germany were, 1. The title *Von;* 2. *Edler von;* 3. *Ritter;* 4. *Bannerherr;* 5. *Freyherr;* 6. *Graf.* Their privileges were originally of little importance; but in several countries they were enlarged to a considerable extent by law as well as by custom and practice. They enjoyed immunity from taxes and an exclusive right to the highest public offices, especially in the army. The most important of these privileges have in modern times either been limited or entirely abolished because they were inconsistent with justice and an obstacle to the prosperity of the state. The French revolution first deprived the nobles of that country of their oppressive privileges and exclusive rights, as that of jurisdiction, &c. (decree of August 4, 1789); and after the overthrow of the feudal system by a number of laws the decree of June 19, 1790, abolished hereditary rank entirely. The senate under Napoleon (August 14, 1806) and the decree of March 1, 1808, gave rise to a new hereditary nobility, with the titles of princes, dukes, counts, barons, and chevaliers, which descended, however, only to the eldest son. After the restoration of the Bourbons (1814) the ancient nobility reclaimed their former rights and privileges. In Norway the *Storthing* abolished nobility by the three successive decrees of 1815, 1818, and 1821. In France hereditary nobility was suppressed by the chamber of deputies on 10th October, 1831. The nobility of Scotland and Ireland have had their privileges limited and defined by the acts of union, that of the former with England in 1707 and that of Ireland with Great Britain in 1800. The higher nobility of England have seats in the upper house of Parliament, while the Scottish peers elect sixteen of their number to represent their order in the upper house in each Parliament, and the Irish peers elect twenty-eight representatives for the same purpose. No new Scotch peerages could be created, but only peers of Great Britain, either in England or Scotland,

from the time of the union of England with Scotland and that with Ireland; and in the three kingdoms, since the union with Ireland, all new peers are peers of the United Kingdom. On the extinction, however, of three existing Irish peerages another may be created, and when the Irish peerage is reduced to 100 a new peerage may be created on the extinction of one of these. A Scotch peer, who is not one of the sixteen representative peers, cannot sit in the House of Commons—a disability not extending to non-representative Irish peers. The ranks of the peerage are being continually recruited, the selection for the most part falling on Scotch or Irish peers or on the unennobled members of noble families; on persons distinguished for eminent public services; on lawyers who have been promoted to high judicial appointments; on persons of extensive property and old family; and sometimes, though rarely, on persons who have acquired great wealth and consequent influence from the successful prosecution of commerce, mining, or manufacturing.

NOBLE, an ancient English gold coin, value six shillings and eightpence, first struck in the reign of Edward III., 1344.

NOCTILUCA. The *Noctiluca miliaris* is one of the Protozoa, possessing an intimate structural relationship with the Infusorian animalcules of that sub-kingdom. This animalcule, which is of minute or microscopic size, is one of those animal forms which possess the power of emitting the phosphorescent light so familiar to all who have sailed on the sea at night. Each movement of the vessel, or each breath of wind rippling the surface of the ocean, produces strange gleams of phosphorescent light, which sweep across the sea. The property of producing this light appears to reside in other animals besides the Noctilucæ—for example, Medusidæ or Jelly-fishes, Annelides, &c.—but these animalcules are the chief cause of the *diffused* light seen over the general surface of the ocean, and they thus exist in immense multitudes in the waters of the sea. The technical or generic name of these forms—*Noctiluca* (Latin, *nox*, night; *luceo*, I shine)—is derived from this circumstance. The minute body, averaging $\frac{1}{70}$th of an inch in diameter, is somewhat ovoid or spherical in shape, and is indented by a 'hilum' or cleft at one side, this structure giving it a somewhat kidney-like conformation. A long 'flagellum' or filament springs from the hilum, and by means of this filament these animalcules move about. The body, like that of all Protozoa, consists of protoplasm, and exhibits a differentiation into an outer layer or 'cuticle,' a middle or cortical layer, and a central mass. A mouth exists near the hilum, and a central particle or 'nucleus' is also contained within the body substance. Quatrefages considers *Noctiluca* as one of the *Rhizopod* Protozoa, but its general structure most nearly approaches that of a Flagellate Infusorian animalcule. Other observers have referred it to the Cœlenterata. See PHOSPHORESCENCE, and Pl. CLXIII.–CLXIV. fig. 21.

NODE, in astronomy, the points in which two great circles of the celestial sphere intersect each other; the straight line of intersection of the circles is called the 'nodal line.' When we speak of the nodes of a planet or comet, we mean the points of intersection of its orbit with the ecliptic. The point at which the orbit passes from south to north of the ecliptic is called the 'ascending node;' the other is the 'descending node.' The longitude of a node is one of the elements of an orbit; it is the angular distance of the node from the first point of Aries.

NODE. When a body is vibrating, the vibratory motion is conveyed from one place to another by the action of the molecular forces of the particles on one another. Now when all the forces acting on a certain particle are at any instant in equilibrium, and the particle consequently remains at rest, there is said to be a node at the particle. The term is generally applied to parts which remain at rest during a considerable period of time, as those parts of the atmosphere at which silence is produced by the interference of sound vibrations, and the motionless parts of bodies of definite shape giving out musical sounds. As no vibration is quite pure in ordinary matter, but is always accompanied by others of longer or shorter periods, there can never be complete rest at any point. When the plate shown in the figure is firmly supported at its middle point in

a level position, and is set in vibration by means of the bow, there are certain lines in it which remain nearly motionless during the vibration. Sand sprinkled on it will remove itself to the nodal lines, as shown in the figure. Each nodal line evidently separates two parts (called 'ventral segments') of the plate which at every instant are moving in opposite directions. The arrangement of lines on the plate depends on the pitch of the musical sound produced by the vibration. A nodal line may be caused to start from any point by lightly touching that point with the finger. If a bell-shaped vessel is filled with water and set in vibration by means of a bow, the positions of the nodes of the bell will be indicated on the water surface. The nodes may be found on the vibrating bell when empty, by allowing a small pith-ball to hang against the sides at different places; at the ventral segments the pith-ball is violently jerked away. When the string of a sonometer (see MONOCHORD) vibrates as a whole, and therefore gives out its fundamental note, the only nodes are those at the fixed ends; when it gives out the octave of the fundamental note a node occurs in the middle of the string; when it gives out the fifth of the octave it divides into three equal vibrating parts or ventral segments, and there are two nodes in the string. If the string be touched by a feather one-third of the length from one end, and a little paper rider be placed at the middle of the remaining part, this rider will be motionless when the string is set in vibration, and is giving out the fifth of the octave of the fundamental note; whereas a rider at any other place will be thrown off at once. Parts of a string on different sides of a node are moving in opposite directions. In the production of

the fundamental note, and the 1st, 2d, 3d, &c., harmonics of a stretched string or wire, the string or wire has respectively 0, 1, 2, 3, &c., nodes (irrespective of the extremities of the string), and the rates of vibration are respectively as the numbers 1, 2, 3, 4, &c. If one side of an open vertical organ-pipe be of glass, and if a stretched horizontal membrane strewed with sand be lowered in the pipe from the top by means of a string, it is found that when the pipe gives out its fundamental tone the sand is thrown into agitation everywhere except at the middle of the pipe, where there is a node; when the pipe gives out other tones than the fundamental, it divides into a number of vibrating parts or ventral segments, separated from one another by nodes. The positions of these nodes are made known by the behaviour of the sand on the membrane. In the production of the fundamental note of an organ-pipe open at both ends, at the middle of its length there is alternately a region of maximum compression and maximum rarefaction of the air. The ends of the pipe are the places of greatest agitation of the air, or the centres of ventral segments. In the production of the fundamental note, and the 1st, 2d, 3d, &c., harmonics of an open organ-pipe, there are respectively 1, 2, 3, 4, &c., nodes. The distance from one node to another in any organ-pipe, open or closed, is always half the length of the travelling air-wave which produces the sound. In the production of the fundamental note of an organ-pipe closed at one end there is always a node at the closed end, and the open end is always the centre of a ventral segment. When the 1st, 2d, 3d, &c., harmonics of the fundamental note are produced there exist in the pipe 3, 5, 7, &c., nodes respectively. We here see why a closed organ-pipe whose fundamental note is the same as that of an open pipe is only half as long.

NODIER, CHARLES EMMANUEL, one of the most eminent writers of modern France, born in 1780, at Besançon, though his birth has been referred both to 1781 and to 1783. He received his first education from his father, who was in some repute as a lawyer. At an early age he proceeded to Strasburg, where he prosecuted his studies under Eulogius Schneider. Returning to his native district, he gave much of his attention to natural history. He went to Paris in 1796, but returned to Besançon in 1798, and became assistant librarian there. At first he had a leaning to republican principles, but was soon drawn into connection with royalist clubs, and wrote with great acrimony against Bonaparte. These philippics subjected him to prosecutions, and even to imprisonment. For several years he lived concealed in the Jura, and then fled to Switzerland, where he supported himself as a corrector of the press until, after many adventures, he returned to France. At Dôle he delivered a course of lectures on belles-lettres. He then again commenced his wanderings, and at last settled at Laibach, where he was made town librarian. In 1814 he returned to Paris. Louis XVIII. rewarded him with a title of nobility and the cross of the Legion of Honour. In 1824 he was appointed librarian to the arsenal, and in 1834 admitted a member of the Academy. He died in 1844. His writings are very numerous. As a critic we are indebted to him for a series of excellent editions of the French classics with notes. As a grammarian and lexicographer he was uncommonly active, and published Dictionnaire des Onomatopés de la Langue Française; Examen Critique des Dictionnaires de la Langue Française; Dictionnaire Universel de la Langue Française; and Elements de Linguistique. Most of his other works belong to belles-lettres. An incomplete collection of his works was published at Paris (1832–34) in twelve vols. 8vo.

NODOSARIA, a genus of Foraminifera (Protozoa), the shell or test of which consists of numerous segments placed one after the other in a longitudinal axis or straight line. Such a shell is produced by one segment after another budding out in a straight or linear manner. Such foraminiferal shells, consisting of numerous segments or chambers, are therefore known as *Polythalamia*. *Nodosaria hispida* is a familiar species of this genus.

NOGENT-LE-ROTROU, a town in France, department Eure-et-Loir, 33 miles W.S.W. of Chartres, at the foot of a steep hill, on which the old Gothic castle of Sully, Henry IV.'s celebrated minister, stands. It is a station on the Great Western Railway from Paris to Rennes. The principal buildings are three churches and an hospital. The manufactures are serge, drugget, bombazine, and leather; and there is a trade in linen, hemp, hay, clover-seed, cattle, &c. Pop. (1881), 7778.

NOIRMOUTIER, an island, France, separated from the north-west of the department Vendée by a narrow and shallow channel. It is of very irregular shape, about 10 miles long, with a breadth varying from 1 to 3 miles. A small proportion of it is under the plough, and very fertile; the rest is partly in meadows and pastures, and partly in waste. The chief town, of the same name, is well built, and has good anchorage and a productive oyster-fishery. Pop. 6347.

NOLA, a town of Italy near Naples, in Caserta, said to have been built by the Etrurians before Rome. It was once a Roman colony, rich and flourishing, and is yet a handsome town. It is a bishop's see. The silk spun in the neighbourhood is much esteemed. Bells are said to have been first made here, and here Augustus died A.D. 14. Near it Hannibal was twice defeated by Marcellus. Giordano Bruno, who, on a charge of heresy and atheism, was burned alive in 1600, was born here. Pop. (1880), 11,931.

NOLLEKENS, JOSEPH, an English sculptor, born in London, 11th August, 1737, was the son of a painter, was placed early under Scheemakers, and in 1759 and 1760 gained premiums from the Society of Arts. He subsequently repaired to Rome, where he had the honour of receiving a gold medal from the Roman Academy of Painting and Sculpture. He remained nine years at Rome, during which time he executed the busts of many Englishmen of distinction, and returned in 1770. He was elected an Associate of the Royal Academy in 1771, and a Royal Academician in 1772. Nollekens was chiefly distinguished by his careful and accurate imitation of nature, and by the absence of any peculiarity of manner. His Venus with the Sandal is esteemed his principal ideal production; but his professional reputation rests principally upon his busts. He died in London, April 23, 1823.

NOLLE PROSEQUI (to be unwilling to prosecute) is a stoppage of proceedings by a plaintiff, and is an acknowledgment that he has no cause of action. It is resorted to for the most part when the plaintiff has misconceived the nature of the action, or the party to be sued.

NOMADS, tribes without fixed habitations, generally engaged in the tending and raising of cattle, and changing their abode as inclination prompts. But landed property and agriculture being the chief supports of a permanent civilization, the nomads are far behind agriculturists in this respect. Nomadic tribes are seldom found to quit their wandering life until they are compelled to do so by being surrounded by tribes in settled habitations, or unless they can make themselves masters of the settlements of a civilized nation. But this change commonly takes place by degrees. Some of the greatest revolutions in history

have been effected by these wandering tribes. North Africa, the interior of North and South America, and the northern and middle parts of Asia, are still inhabited by nomadic tribes. Different tribes, however, possess different degrees of civilization. Some are little better than bands of robbers.

NOMENCLATURE, CHEMICAL. See CHEMISTRY.

NOMINALISM, in dialectics. A clear view of nominalism depends upon a proper understanding of the scholastic philosophy. Charlemagne had established schools for the education and formation of clergymen, in which the (so-called) seven liberal arts (the *trivium* and *quadrivium*) were taught. As in those times research and speculation were not allowed to go beyond the dogmas of the church, philosophy, or rather dialectics, applied itself only to theology. It was at first enthralled by the fetters of the schools, and at a later period by the fear of the imputation of heresy. Thus originated, in the limited field to which the human mind was confined, a system of dialectics, which sought satisfaction in logical subtleties and empty forms, but which, however, tended much to exercise the acuteness of the European nations. A great schism in scholastic philosophy was caused by (the so-called) *nominalism*, the founder of which was John Roscellin, canon of Compiègne, who maintained, among other doctrines then considered heresies, that all general ideas are mere words, *nomina*, names (*flatus vocis*). The *realists* (from *res*, thing), on the other hand, maintained that general ideas are not formed by the understanding, but have a real existence independent of the mind, and apart from the individual object, that, for example, beauty in the abstract has a real existence, apart from a beautiful thing. The doctrine of Roscellin was condemned at Soissons, 1092, and the realists, who disagreed among themselves only upon some unimportant points, became the predominating school. In the eleventh century a reconciliation was attempted between the two opposing theories by the celebrated Abelard, who taught that, although general ideas are not found actually existing in the objects themselves, they can yet be conceived by the mind as existing independently and apart from any concrete embodiment of them, and that accordingly they are not mere words. This doctrine was called conceptualism. During the twelfth century the controversy between the nominalists and the realists was carried on with great keenness, and in the beginning of the fourteenth century the dispute was revived by the English Franciscan William of Occam, a disciple of the famous Duns Scotus (who taught at Paris), in such a way that the nominalists were at length victorious. The philosophical adversaries gave vent to their feelings in the spirit of the time, by blows. (See D'ISRAELI'S CURIOSITIES OF LITERATURE.) Among the supporters of nominalism should be mentioned the celebrated John Buridan of Bethune (1350), Robert Holcot (died 1349), Gregory of Rimini (died 1358), and Henry of Hessia (died 1397). The nominalists were, indeed, often persecuted (in Paris, 1339, 1340, 1409, 1473); but they gradually gained the ascendency in the universities of France as well as in Germany.

NOMINATIVE CASE, in grammar, the case in which the subject of a verb stands. It designates the substance absolutely, without relation to any other substance.

NON-ACTIVITY, PRINCIPLE OF, in the law of nations. See NEUTRALITY.

NONANE, the ninth member of the paraffin or marsh-gas series (which see), sometimes called *nonyl hydride* (see NONYL). The name nonane is, however, better, as it fixes the position of the compound in regard to members of the same series, and also separates this series from all others. Nonane has the composition C_9H_{20}; it may be obtained from that portion of petroleum oil which distils over above 120°; it is a colourless liquid, with an odour somewhat resembling that of lemons; it boils between 134° and 137°.

NON-APPEARANCE, a term used in law to signify the failure of a party, against whom an action has been raised, to enter an appearance for the purpose of defending himself. The modes for a defendant to appear are—(1), in person; (2), by attorney; (3), by guardian; or (4) by committee.

NON-COMMISSIONED OFFICERS are officers in the British army intermediate in rank between the commissioned officers and privates. They are selected from amongst the latter, and are generally the most meritorious of these. They vary in rank, and comprise serjeants-major, serjeants, trumpeters, drummers, farriers, &c., and the corporals in the Royal Horse Guards and in the Life Guards. Their duties are various, but in general it may be stated that they overlook the men when off parade and whilst in barracks. Non-commissioned officers are entitled to quarters for their wives, and have a *mess* to themselves. They can only be reduced to the ranks by the colonel-commandant or by court-martial. The armies of other nations have a class of officers corresponding to these.

NON COMPOS MENTIS, an expression used of a person who is not of sound memory and understanding, and therefore not legally responsible for his acts. See LUNACY.

NONCONFORMISTS, those who refuse to join the Established Church in England. The name was at first particularly applied to those clergymen who were ejected from their livings by the Act of Uniformity in 1662. Their number was about 2000. The act required that every clergyman should be reordained, if he had never received episcopal ordination; should declare his assent to everything contained in the Book of Common Prayer; take the oath of canonical obedience; abjure the Solemn League and Covenant; and renounce the principle of taking arms against the king. All the royal promises of toleration and of indulgence to tender consciences were thus eluded and broken. The Presbyterians, Independents, &c., refused to conform, and were exposed to the most cruel persecutions. By the Five Mile Act (1665) it was enacted that no dissenting teacher who would not take the oath abovementioned should approach within 5 miles of any corporation, or of any place where he had preached after the act of oblivion; this act was intended to deprive them of all means of subsistence. Other acts of a similar character were passed; but on the accession of William III. these penalties and disabilities were removed by the Toleration Act. Some of these oppressive provisions were revived during the reign of Queen Anne, but were finally repealed in 1718. The name *Nonconformists*, in consequence of this change of circumstances, gave way to that of *Dissenters*. The chief dissenting sects are the Presbyterians, Independents, Baptists, Friends or Quakers, Methodists, and Unitarians, the Catholics not being commonly comprehended under this term. The statute 53d Geo. III. cap. lx. repeals so much of former acts as excepted persons denying the Trinity from the benefit of the Toleration Act, or imposed penalties on such persons. Protestant Dissenters were thus at least practically delivered from penal restrictions in the exercise of their religion. The repeal of the Corporation and Test Acts in 1828 removed the civil disabilities under which they had previously been placed. See PURITANS.

NON-EFFECTIVE, the term applied in military language to designate that portion of the forces not

in active service or not in a condition to proceed to active service, such as retired officers, pensioners, and the like.

NONES. See CALENDAR.

NON EST INVENTUS, a phrase in law used in a sheriff's return to a writ when he has been unable, after suitable search, to find the defendant in a suit.

NON-JURORS, a term applied to those of the clergy of the Church of England who, believing that the Stuarts had been unjustly deposed, refused to take the oath of allegiance to William and Mary on their accession to the throne of England. A certain time was allowed them to reconsider their refusal, and on its expiry all those who still adhered to the position they had taken up were deprived of their sees and benefices. The non-jurors numbered upwards of 400 clergy, including one archbishop and eight bishops.

NONNUS, or NONNOS, a later Greek poet, who lived about the beginning of the fifth century A.D. He was born at Panopolis, in Egypt. He is the author of a poem entitled Dionysiaca, in forty-eight books, in which the expedition of Bacchus (Dionysus) to India is described. The style is inflated and prolix; the descriptions go too much into detail; the epithets are often unnecessarily accumulated and far-fetched; but the versification is good, and the tone is animated. Nonnus also wrote a paraphrase, in verse, of the Gospel of St. John, which may serve as a commentary, being very perspicuous, though not very poetical.

NON-RESIDENCE, a term in church law designating the offence of which an incumbent is guilty when he illegally absents himself from his benefice. By 1 and 2 Vict. cap. cvi. an incumbent, except in the case where he holds two benefices or has the bishop's license, if he absents himself from his benefice for a period exceeding three months, but not exceeding six months, forfeits one third-part of the annual value of the benefice from which he absents himself; if such absence exceeds six but not eight months he forfeits one half-part of such annual value; if it exceed eight months he forfeits two third-parts; and if absent for twelve months three-fourths of the annual value. The persons excused from the obligation of residence by the canon law are sick persons, persons engaged in teaching the theological sciences in approved places of study, and canons in immediate attendance upon the bishop, who ought not to exceed two in number. As early as the Council of Nice in 325 the offence of non-residence, owing to its frequency, was the subject of special legal enactments.

NON-RESISTANCE, DOCTRINE OF, is that doctrine which teaches that it is unlawful, on religious grounds, to resist forcibly the commands of a ruler or magistrate. St. Paul and others of the New Testament writers urge the necessity of obedience to those in authority. Though, as usually understood, the doctrine refers only to the lawful commands of magistrates, a different meaning was attached to it by those who maintained that obedience is to be rendered to all the commands of a ruler without exception; not even when the ruler was a usurper or a tyrant was forcible resistance to be offered. This view of the doctrine had reference only to the chief ruler; it does not appear to have ever been maintained that equally passive obedience was due to inferior magistrates. The advocates of this view invested the sovereign with a sanctity not accorded to any one else. The doctrine is thus closely connected with—may indeed be said to proceed from—the doctrine of the divine right of kings, for where that right is maintained unqualified obedience must necessarily follow. Hobbes maintained the absolute supremacy of kings, and their right to exact unquestioning obedience from their subjects. This view was the outcome of his social contract theory. Others arrived at the same result, though by a different process, namely, by a peculiar interpretation of Scripture. In the Homilies of the Church of England the doctrine is enjoined; it was sanctioned by a decree of the University of Oxford in 1622, and again in 1683.

NONSUIT. Where a person has commenced an action, and at the trial fails in his evidence to support it, or has brought a wrong action, he is nonsuited. There is this advantage attending a nonsuit, that the plaintiff, though he pays costs, may afterwards bring another action for the same cause, which he cannot do after a verdict against him.

NONYL. Nonyl is the ninth member of the series of alcoholic radicles, the general formula of which is C_nH_{2n+1}. As has been already explained under methyl (which see), these radicles are not known in the free state. At the moment of their liberation from compounds these radicles combine with themselves to form the saturated molecules C_nH_{2n+2}; thus the double molecule of nonyl, or

$$\begin{matrix} C_9H_{19} \\ | \\ C_9H_{19}, \end{matrix}$$

is the same as the paraffin $C_{18}H_{38}$. The derivatives of nonyl have been very little studied as yet.

NONYLENE. This, the ninth member of the olefine series (see HYDROCARBONS and OLEFINES), is a colourless liquid, with a penetrating odour; it is lighter than water, in which liquid it is insoluble; in alcohol and ether it readily dissolves. Nonylene burns with a bright white flame; it boils at about 250°. This hydrocarbon, which has the formula C_9H_{18}, may be prepared by distilling amylic alcohol with zinc chloride, and rectifying the distillate. Like the other olefines, nonylene combines readily with bromine to form the compound nonylene dibromine $C_9H_{18}Br_2$.

NOOTKA SOUND, an inlet of the North Pacific Ocean, on the western coast of Vancouver's Island, discovered by Captain Cook in 1778; lon. 126° 36′ w.; lat. 49° 35′ N. The sound embraces several islands, the largest being called Nootka. The water is from 47 to 90 fathoms deep. There are many anchoring-places and good harbours. The shores are inhabited by Indians, and the land is hilly and well wooded. It extends in a north-east direction about 10 miles inland, but in no part is it more than 500 yards broad.

NORD, a department in the north of France, bounded north-west by the North Sea, north-north-east and east by Belgium, south-east by Aisne, south-west and west by Pas-de-Calais and Somme; area, 2170 square miles. The coast, marked by a long chain of sandy hillocks, furnishes the two harbours of Dunkirk and Gravelines. The interior is a monotonous but fertile alluvial flat, intersected by sluggish streams and canals. The husbandry, nearly akin to that of Flanders, is careful, skilful, and productive. The department is essentially agricultural, upwards of four-fifths of the area being under cultivation. The principal mineral is coal, which is wrought to a considerable extent in different quarters, and forms a continuation of the Belgian coal-field. Its iron-mines are also very productive. Pop. in 1881, 1,603,259.

NORDEN, a seaport town of Prussia, in Hanover, 16 miles north of Emden, on a canal which at a short distance communicates with the sea. It is an old place, but tolerably well built; has an ancient church, Roman Catholic chapel, synagogue, Latin school, and hospital; manufactures of soap, chicory, and tobacco;

iron-foundries and ship-building yards. It has a considerable shipping trade. Pop. (1880), 6617.

NORDERNEI, or NORDERNEY, a small island, now belonging to Prussia, on the coast of East Friesland, to which there is a foot-path from the continent at low tide; area, about 5 square miles. On the north-western side is a village with 700 inhabitants (mostly seamen), and an establishment for sea-bathing, much resorted to during the summer. On the south-east side are downs from 40 to 80 feet high.

NORDHAUSEN, a town, Prussian Saxony, 38 miles N.N.W. of Erfurt, at the foot of the Seyersberg, and on the Zorge and Golden Aue. It has walls flanked with towers, seven gates, two fine paintings by Lucas Cranach in one of its churches, a town-house, and gymnasium. Its manufactures are woollen and linen cloth, lacquer-ware, and chemicals. It has also extensive breweries and distilleries, and a considerable trade in corn and cattle. Pop. in 1880, 26,198.

NORDLINGEN, a town in Suabia, which in 1802 came into the possession of Bavaria. It is surrounded by walls, flanked with towers, and is entered by five gates; has a handsome Gothic cathedral, surmounted by a remarkable tower 345 feet high; manufactures of carpets, woollen and linen goods, leather, and glue; and a considerable trade in corn. The Swedes were defeated here, September 6, 1634, for the first time on German ground. (See THIRTY YEARS' WAR.) The battles of 1645, 1796, and 1800 have also contributed to make the place memorable. Pop. (1880), 7837.

NORDSTRAND, an island of Prussia, separated by a narrow channel from the south-west coast of Schleswig. The far greater part of it was swept away in 1634 by a flood, which drowned 15,000 persons, of whom 6400 belonged to Nordstrand alone, and immense numbers of cattle. A part of what escaped the waves now forms the separate islands of Pelworm and Halligen. The present area of Nordstrand does not exceed 21 square miles; formerly its area was ten times as great. Pop. about 2500.

NORE.—1. A part of the estuary of the Thames, England, about 50 miles below London, and east of Sheerness. It is encumbered with sand-banks, on one of which there is a floating light.—2. A river, Ireland, which rises in the Sliebhbloom Mountains, on the borders of Tipperary and Queen's County, flows S.S.E. through Kilkenny, Thomastown, and Inistioge, and joins the Barrow about 2 miles above New Ross. Its rapid current makes navigation difficult, but it admits vessels of considerable size as far as Inistioge, and barges to Thomastown.

NORFOLK, a maritime county of England, bounded north and north-east by the North Sea, south and south-east by Suffolk, west and north-west by Cambridge and Lincoln and the Wash. Area, 1,356,173 acres, of which about 1,200,000 acres are arable, meadow, and pasture. The surface is generally flat, with some slight swells and depressions in the north part. The coast consists principally of cliffs, partly chalk and partly alternate strata of clay, gravel, loam, and sand. These are gradually undermined by the sea, which is everywhere making inroads on the land. Several villages have been at various periods swept away, the sites they occupied now forming part of the bed of the German Ocean. These encroachments of the sea are still in progress. The general appearance of the country in Norfolk is extremely uninteresting; the undulations of the surface not being sufficient to relieve the eye, while the luxuriant effect of rich woodland is not always to be met with. But these deficiencies are compensated by the evidences of careful cultivation, and the pleasing tokens of human industry so frequently and prominently brought before the eye of the traveller. The climate on the east coast is dry throughout the year, and cold biting winds prevail during the winter and early in spring. This county has perhaps a higher reputation than any other district in England for its progress in agriculture (although numerous instances of very indifferent husbandry present themselves), yet it has nothing indigenous which commands a first-rate price in the market. The Norfolk sheep are almost superseded in their own district by the Southdown; and the fine cattle which are sent to Smithfield from this county are merely fattened here—the native breed, the 'Norfolks' or 'Home-bred's,' being held in little estimation. In 1883 there were in the county 44,232 agricultural horses, 117,497 cattle, and 559,146 sheep. In the north and west districts the soil is light and sandy; in the central and east parts generally loamy, varying in quality, being here and there stiff and difficult to manage, but mostly light and incumbent on a marly clay. Here also extensive marshes occur, some of which are peculiarly favourable for the growth of corn; but their liability to inundation has induced the inhabitants to prefer the dairy system, and in these parts large quantities of butter are made and exported under the name of 'Cambridge.' The quantity of permanent pasturage was in the year 1883, 264,943 acres, of corn crops 438,273 acres, and 202,060 acres of green crops. The crop raised in greatest perfection is barley, which, indeed, may be considered as the most important portion of the agricultural produce. Most of it is made into malt, and then shipped. Vast numbers of turkeys are reared; pheasants, partridges, and rabbits abound. The manufactures, except for home consumption, consist chiefly of woven goods, which in a variety of branches still constitute the staple trade. Norfolk has extensive fisheries of both herrings and mackerel; the former, however, being by far the most important. It returns ten members to Parliament, namely, six for the county, two for the city of Norwich, and two for the borough of King's Lynn; Thetford and Yarmouth have been disfranchised. Pop. (1871), 438,656; (1881), 444,749.

NORFOLK, a city and port in the county of the same name, Virginia, U.S., on the river Elizabeth, 32 miles from the ocean. It lies low, has irregular and crooked streets, a court-house, jail, city hall, theatre, several academies, orphan asylum, mechanics' hall; and in the vicinity a marine hospital and a navy-yard, with a dry dock, constructed of hewn granite; and 26 churches. The harbour is safe and commodious. It has a greater foreign commerce than any other place in the state. Pop. in 1880, 21,966.

NORFOLK, DUKE OF. See HOWARD (THOMAS).

NORFOLK ISLAND, in the South Pacific, in lat. 28° 58′ S., and lon. 167° 46′ E., about 400 miles north-west of New Zealand. It is about 6 miles long by 4 broad, and has a bold rocky shore without harbour or roadstead, but a fertile soil and luxuriant vegetation, and a delightful and salubrious climate, producing wheat and maize in great abundance. It was discovered by Captain Cook in 1774, when it was uninhabited. In 1789 a British settlement was formed here from Sidney, but it was afterwards made a penal settlement until the transportation system was abolished. It was then, in 1857, assigned to the Pitcairn Islanders for their residence.

NORICUM was, among the Romans, that part of the south of Germany which is situated between the Save, the Lake Pelso, Rhætia, Vindelicia, and the Danube; but its boundaries were not the same at all times. The Celts inhabited this country.

NORMAL. The straight line drawn from any point in a curve in its plane at right angles to the

tangent at that point is a normal to the curve. The straight line drawn from any point in a surface, at right angles to the tangent plane at that point is a normal to the surface. The section of a surface by a plane containing a normal drawn from any point is called the 'normal section' at that point.

NORMAL SCHOOLS, called also TRAINING COLLEGES, institutions established for the express purpose of giving instruction in the principles and art of teaching. So much depends upon the fitness of a teacher for his work, that the necessity of special preparation for it is almost universally admitted, though only at a comparatively recent date were steps taken to afford means for the due qualification of teachers. This means is now furnished by the normal schools. The name is derived from the French *écoles normales*, established with the same object at the close of last century. The aim of these schools is not so much to teach the sciences—although this is not neglected—as to teach the students the art of teaching others. Not only must the student, on leaving the normal school, be well instructed himself, but he must be capable of communicating instruction to others. In most of the principal countries of Europe, and in America, normal schools, or institutions with similar aims, have been established. Among the earliest in Great Britain was the General Assembly's Normal Institution, founded in 1830.

NORMAN ARCHITECTURE. See ARCHITECTURE—Romanesque Style.

NORMANDY, an ancient province in the north of France, bounded north and west by the English Channel, east by Picardy and Isle of France, south by Maine and Brittany; greatest length, about 150 miles; breadth, 75 miles; area, 10,500 square miles. On the decline of the Roman Empire it was seized by the Franks, and afterwards, in the tenth century, wrested from them by the Normans, from whom it has derived its name. By the Treaty of St. Claire-sur-Epte Charles the Simple gave his sanction to the conquests made by the Normans, and Rollo, their chief, received the title of Duke of Normandy. William the Bastard, sixth in succession from Rollo, having conquered England and ascended its throne in 1066, Normandy became annexed to England. On the death of William the Conqueror it was separated from England, and ruled by his son Robert, and was afterwards ruled by the kings of England until Philip Augustus wrested it from John, and united it to France in 1203. After this it was several times invaded by the English, but finally recovered by the French, in 1450. Normandy was divided into Upper and Lower Normandy; Rouen was the capital of the former, Caen of the latter. It now forms five departments—Seine-Inférieure, Eure, Calvados, Manche, and Orne, with the exception of arrondissement Mortagne. It is one of the richest and most fertile parts of France. The inhabitants are distinguished for intelligence and shrewdness. (See NORTHMEN.) Normandy holds a good position in the French literary world. The Norman trouvères in ancient times ranked high as poets; and in modern times men like Corneille, Malherbe, Bernardin de St. Pierre, La Place, and others, have sustained its early renown.

NORMANS. See NORMANDY and NORTHMEN.

NORRIS, EDWIN, an eminent English linguist, and one of the founders of Assyriology, was born October 24, 1795. He passed several years of his youth on the Continent as a private tutor, and was afterwards appointed to a clerkship in the India House. He subsequently became one of the interpreters to the foreign office, and for his services in this capacity received a small pension. For more than twenty-five years he discharged the duties of secretary to the Asiatic Society. His connection with this society encouraged him to prosecute his philological studies with increased zeal. In 1846 his attention was turned to the study of cuneiform writing by Sir Henry Rawlinson's copy and analysis of the great cuneiform record of Darius Hystaspes, at Behistun in Persia, which he superintended in its course through the press, and he soon began to be regarded by oriental scholars as one of the chief authorities in cuneiform philology. Besides rendering essential service to Sir H. Rawlinson in other publications, he assisted him in publishing for the British Museum two volumes of cuneiform inscriptions. The great work, however, of Norris is his Assyrian Dictionary (1868–72), in three volumes, which, though incomplete, marks an epoch in cuneiform studies. The Celtic dialects also received a considerable share of his attention; in 1859 he published the text and translation of three Cornish dramas, in two volumes. Other publications of his which may be mentioned are A Specimen of the Vai Language of West Africa (1851); A Grammar of the Bornu or Kanuri Language (1853); and Dialogues and a Small Portion of the New Testament in the English, Arabic, Haussa, and Bornu Languages (1853). Norris died on the 10th Dec. 1872.

NORRISTOWN, a town, United States, Pennsylvania, on the Schuylkill, here crossed by a bridge 800 feet long, 16 miles N.W. of Philadelphia. It has spacious, well-built streets, Episcopal, Presbyterian, and Catholic churches, several schools, a fine court-house, a public library; several extensive woollen and cotton factories, rolling-mills, foundries, flour-mills, glass works, and other establishments. Pop. in 1880, 13,063.

NORRKÖPING, a town of Sweden, 24 miles north-east of Linköping, at the mouth of the Motala Elf in the Bravik, a gulf of the Baltic. The environs are beautiful, and the site of the town is one of the finest in the kingdom. The Motala Elf flows through the town, making several falls within it, and forming two islands, and is crossed by several bridges. It is well and regularly built, and has important manufactures of linen, hosiery, starch, lacquerware, soap, and tobacco; oil, paper, and other mills; sugar-refineries, and building-yards, at which a number of handsome steamers have been fitted out. Pop. (1880), 26,735.

NORTE, RIO GRANDE DEL, a river of Mexico, which rises in the Rocky Mountains, near the sources of the Arkansas, about lat. 41° N., runs S.S.E., and empties itself into the Gulf of Mexico, lon. 96° 40′ W.; lat. 26° N. It serves but little the purposes of navigation, owing to the sand-bars in the flat country and the rapids in the upper part. Its mouth is 1200 feet wide, but is barred so as to afford entrance only to boats, which, however, can ascend to Paso del Norte, lat. 32° 9′ N., where rapids and shoals commence. Length, about 2000 miles.

NORTH, FREDERICK, LORD, Earl of Guildford, an English statesman, was the eldest son of Francis, second earl of Guildford, and was born in 1732. He received his education at Eton School and Trinity College, Oxford, after which he passed some time at Leipzig. Returning to England, he obtained a seat in the House of Commons, and in 1759 was appointed a commissioner of the treasury. On the resignation of Lord Bute, in 1763, he was made head of that board, which post he held till 1765; and the next year he was made joint receiver and paymaster of the forces. At length, in 1767, he became chancellor of the exchequer, and in 1770 first lord of the treasury. His administration lasted till 1782, during a period of peculiar difficulty and danger. Having accepted of office at a time when the court party had become unpopular, on account of the secret influence supposed to be possessed by Lord Bute, something

of that unpopularity attached to the whole course of Lord North's ministry. But this was greatly augmented by the contest with the North American colonies, which ended in the loss of that part of the British Empire, after the expenditure of a vast deal of the national wealth, and the sacrifice of multitudes of lives. For this disastrous measure of subjugating America the premier appears to have been a sincere advocate; and in defending his proceedings against the attacks of Mr. Fox and his party, in Parliament, he evinced a degree of political skill and resolution which would have done honour to a better cause. After losing office a league was formed between his lordship and the Whigs, which led to the famous coalition ministry; but this heterogeneous administration lasted only a few months, after which Lord North held no responsible station in the state. He succeeded to the earldom of Guildford in 1790, on the death of his father, and died in 1792, having been afflicted with blindness several years before his death.

NORTH ADAMS, a town of the United States, Berkshire county, Massachusetts, on the Hoosac river, near the west end of the great Hoosac tunnel, 20 miles N.N.E. of Pittsfield, situated among lofty hills and fine scenery. The manufactures, which form the leading interest of the place, consist of cotton and woollen goods (the produce of about twenty factories), boots, shoes, paper, nitro-glycerine, and other articles. In the boot and shoe trade a considerable number of Chinese are employed. There are about 20 churches, several large hotels, banking establishments, &c. In the vicinity are the Sand Springs, a popular place of summer resort. The Pittsfield and North Adams, and the Troy and Boston railways terminate here. Pop. in 1880, 10,191.

NORTHALLERTON, a parliamentary borough of England, Yorkshire, in the North Riding, 32 miles N.N.E. of York, on the North-Eastern Railway. It consists of one long and spacious street, with a few smaller back ones; and has a parish church recently restored, several other places of worship; a town-hall, court-house, prison, several charitable institutions, &c. The inhabitants are chiefly engaged in agriculture, and some tanning and currying are carried on. It sends a member to Parliament. Pop. in 1881, 5445.

NORTH AMERICA, the northern half of the western continent, or New World, extends from the 15th degree of north latitude, measuring from the most southerly point of Mexico, to the Arctic Ocean, and from 55° 30′ to 168° w. lon. It is bounded on the north by the Arctic Ocean, on the east by the Atlantic Ocean and the Gulf of Mexico, on the south by Central America and the Gulf of Mexico, and on the west by the Pacific Ocean. Its length, from Hudson's Straits to the Florida Channel, is 4800 miles, and from the latter along the inland sea to Panama, about 4500. The more remarkable of its coast indentations and inlets are Baffin's Bay, Hudson's Bay, and the Gulf of St. Lawrence on the east coast, the Gulf of Mexico on the south, and the Gulfs of California, Georgia, and Cook's Inlet on the west. Two extensive mountain chains run near and parallel, the one to its east, the other to its west coast; and a vast plain lying between these chains extends north and south from the Arctic Ocean to the Gulf of Mexico. In this plain are situated the great lakes of North America. Other remarkable physical features of this continent are its sandy deserts, extending along the base of the Rocky Mountains to the 41st degree of north latitude, and having a breadth averaging from 400 to 600 miles; its steppes in the northern regions of the continent; its prairies and marshes, the former being peculiar characteristics of North America, and occurring chiefly in the Mississippi valley. These prairies or savannahs consist of extensive, elevated, and generally irregular tracts without trees, though sometimes capable of producing them, covered in the spring with long grass intermingled with fragrant flowers.

Mountains.—Of these there are two principal systems in North America, the Rocky Mountains in the west, and the Alleghanies or Appalachian Mountains near the east coast. The Rocky Mountains, including under that name the whole of the great elevated belt of mountain chains and plateaus running northward from the south of Mexico to the Polar Sea, form the back-bone of the continent, and one of the greatest mountain systems on the globe. The Rocky Mountains may be looked upon as a continuation of the Andes, which they almost equal in length, and greatly exceed in mass from their much greater breadth. This mountain system, where it is most fully developed, may be divided into three chief regions—on the east the double chain of the Rocky Mountains proper, then a region of lofty, broken, and irregular table-lands, and on the west a very high and irregular mountain chain, which includes the Pacific Alps of the north-west, the Cascade Range in British Columbia and the north-west of the United States, the Sierra Nevada of California, and the Peninsular chain of California. The highest part is between lat. 42° and 53° N., where several peaks rise far above the snow-line, Mount Hooker attaining an elevation of 15,700 feet, and Mount Brown 15,990 feet. Further north they decrease to 4000 and 2000 feet. The Appalachian mountain system stretches from Georgia and Alabama in the south-west to the Gulf of St. Lawrence in the north-east, and we may even include in it the Watchish or Wotchish Mountains of Labrador. In the north-east it comprehends the Green Mountains, the White Mountains, and the Adirondack group; from Pennsylvania southward Alleghany Mountains is the name that strictly belongs to it. The Alleghanies consist chiefly of four separate groups crossing the country in the same general direction from north-east to south-west. Their mean elevation does not exceed 2500 feet. The highest summits of the Appalachian system are Mount Mitchell in North Carolina, 6470 feet, and Mount Washington in New Hampshire, 6226 feet.

Rivers and Lakes.—The principal rivers are the Missouri-Mississippi and the St. Lawrence. The former has its origin in the Rocky Mountains, at about lat. 45° 20′ N.; lon. 110° 30′ W., by the junction of three streams, and falls into the sea in the Gulf of Mexico in lat. 27° N., traversing in its course a distance estimated at upwards of 4400 miles. It has obtained its double name from the Missouri forming about two-thirds of its earlier course. The St. Lawrence rises under the name of the St. Louis in lat. 47° 45′ N.; lon. 93° W.; flows north-east by north, and falls into the Gulf of St. Lawrence. It is more than 100 miles wide at the mouth. The Arkansas, Red River, and Ohio, are all tributaries of the Mississippi, and have their sources in the Rocky Mountains. The Rio Grande del Norte has also its source in the Rocky Mountains, and falls into the Gulf of Mexico. The Mackenzie issues from the Great Slave Lake, and flowing northward, falls into the Arctic Sea. The Columbia and the Colorado are the only large rivers on the western declivity of the Rocky Mountains. The Yukon, which falls into Behring's Sea, and has the principal part of its course in Alaska Territory, is also a large river; as is likewise the Saskatchewan, which enters Lake Winipeg, its waters being conveyed to Hudson's Bay by the Nelson.

In the number and the magnitude of its lakes, and in the internal means of commercial intercourse afforded by these, North America is unequalled by any

ARCTIC OCEAN
GREENLAND
ASIA
ALASKA
United States Territory
DOMINION OF CANADA
HUDSON BAY
BAFFIN BAY
DAVIS STRAIT
Hudson Strait
LABRADOR
NEWFOUNDLAND
ICELAND
Behring Strait
Alaska Mts
Alaska Peninsula
Queen Charlotte Islands
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
ASSINIBOIA
MANITOBA
ONTARIO
QUEBEC
NEW BRUNSWICK
NOVA SCOTIA
MONTANA
NORTH DAKOTA
Melville Island
Parry Islands
Hayes Peninsula
Baffin Land
Fox Channel
Southampton Isl.
Victoria Land
Banks Land
Grant L.
Grinnell Land
Ellesmere Land
Greenland
Iceland
Disco I.
Cape Farewell
Hall Pen.
Melville Sound
Prince of Wales Str.
Great Bear Lake
Great Slave Lake
Athabasca
Lake Winnipeg
Lake Superior
Hudson Bay
James's Bay
Gulf of St. Lawrence
Cape Breton I.
Halifax
C. Sable
Montreal
Ottawa
Quebec
Boston
Portland
Toronto
Lake Huron
Lake Michigan
St. Paul
Columbia R.
Fraser R.
Mackenzie R.
Yukon R.
Red River
Saskatchewan R.
Churchill R.
Nelson R.
St. Lawrence R.
Ottawa R.
Vancouver I.
Victoria
Fort Simpson
Fort Norman
Fort Resolution
Fort Rae
Fort Reliance
Fort Providence
Fort Simpson
Fort Liard
Fort Nelson
Fort Vermilion
Fort Chipewyan
Fort Wrigley
Fort Selkirk
Fort Yukon
Fort Hearne
Fort Churchill
Fort York
Fort Severn
Fort Rupert
Fort Simpson
Fort Norman
Fort Resolution
Fort Rae
Fort Reliance
Fort Providence
Fort Liard
Fort Nelson
Fort Vermilion
Fort Chipewyan
Fort Wrigley
Fort Selkirk
Fort Yukon
Fort Hearne
Fort Churchill
Fort York
Fort Severn
Fort Rupert

BLACKIE & SON GLASGOW, EDINBURGH & LONDON.

other continent. Lakes Superior, Michigan, Huron, Ontario, and Erie together cover an area of 90,700 square miles. The largest, Lake Superior, averages in length 400 miles, and in breadth 80. Following the chain of lakes which crosses the country in a north-westerly direction there occur Lakes Winnipeg, Woolaston, Deer Lake, Athabasca, Great Slave Lake, and Great Bear Lake.

Islands.—In the Atlantic Ocean the principal are Newfoundland, Anticosti, Prince Edward's Island, and Cape Breton, all at the mouth of the St. Lawrence; the Bahama Islands, off the peninsula of Florida and the Gulf Stream, and some of the other West India Islands may also be said to belong to it. On the north-west coast the principal islands are Vancouver's Island, with an area of 30,000 square miles; further north, Queen Charlotte's Island; then King George III.'s Archipelago, which contains, besides a number of small islands, Prince of Wales Island, Sitka Island, and Admiralty Island. Next follow the Aleutian Islands, stretching west from the peninsula of Aliaska. In Behring's Straits are the group of Pribylof and Nounivok, belonging to Russia. In the Arctic Ocean there are a vast number of islands of which little comparatively is yet known. Besides these there is a multitude of small islands and rocks scattered along the west coast, particularly between San Francisco and Cape St. Lucas, at the south extremity of the Californian peninsula.

Geology, Mineralogy, &c.—A remarkable analogy exists in the structure of the land in North America and Central and Northern Europe. Gneiss, mica schist, and granite prevail over wide areas in the Alleghanies; on the Atlantic slope and the northern and middle latitudes of the American continent the Silurian strata extend over 2000 miles. Crystalline and Silurian rocks form the substratum of Mexico, for the most part covered with plutonic and volcanic formations and secondary limestone. The Rocky Mountains are mostly Silurian, except the eastern ridge, which is of stratified crystalline rocks, amygdaloid, and ancient volcanic productions. The coast chain has the same character, with immense tracts of volcanic rocks both ancient and modern, especially obsidian. In North America volcanic action is entirely confined to the coast and high land along the Pacific. The principal minerals are gold, silver, copper, iron, lead, and coal. The first three are found in greatest abundance in Mexico; but since 1848 the great gold-field has been California, and one or two of the other western states, where large quantities have been obtained. The coal-fields of North America are of prodigious extent, the Appalachian stretching without interruption 720 miles, with a maximum breadth of 280, and occupying an area of 63,000 square miles. The Pittsburgh seam, 10 feet thick, is 225 miles in length and 100 in breadth, and covers an area of 14,000 square miles. Other extensive fields exist throughout the country. Iron is worked in many parts of the States. Salt is likewise widely diffused.

Climate.—The predominating character of the climate of North America is intense cold, although over a great part of it an oppressive heat prevails during a portion of the summer. In British America the thermometer rises in July 20° higher than in London. Above the 50th degree of latitude the cold is so severe as to render the country all but uninhabitable, while frosts occasionally occur as low down as the 30th degree of latitude. In winter a keen and piercing north-west wind prevails throughout all North America, adding greatly to the rigour of the northern climate, and carrying its chilling influences into the more southerly regions. The transitions from cold to hot, or from winter to summer, are very sudden, especially in Canada, where there is little or no spring.

Vegetation.—The forests of North America are of vast extent, and the individual trees of the most magnificent dimensions, some of the former covering an area of 60,000 square miles, and many of the latter attaining a height of 200 and 300 feet, with a circumference of 80 feet. The forests of Canada consist chiefly of pines, oak, ash, hickory, red beech, birch, and the lofty Canadian poplar; those of the United States of sycamore, chestnut, black walnut, hickory, maple, white cedar, wild cherry, red birch, locust-tree, oak, ash, &c., and the tulip-tree, the pride of the American forest. The Arctic flora of America has much the same character with that of Europe and Asia.

Maize or indian-corn, the only important farinaceous plant peculiar to the New World, has a very extensive range in North America, although a strong heat of considerable duration is necessary to its successful cultivation. Millet, cocoa, pimento, vanilla, copäiba, chinchona, jalap, sassafras, nux vomica, tobacco, and the cochineal plant (*Cactus cochinilifer*), &c., are also indigenous. So likewise is the potato, now so widely diffused throughout Europe. Wheat, barley, oats, pease, and rice succeed well throughout large portions of the continent; so also do various kinds of fruit-trees, such as oranges, peaches, lemons, and apples, but the native fruits are mostly of the nut kind. Sugar, coffee, and cotton are amongst its staple vegetable productions. The vine has in recent times been successfully cultivated in some parts of the continent.

Zoology.—North America furnishes numerous specimens of vertebrated animals, some of these being distinguished for their ferocity. The polar and grizzly bears are the most remarkable of this class. Of the Carnivora the principal are the various kinds of bears, dogs, wolves, foxes, the panther, lynx, and wild-cat, with the hedgehog, shrew, shrew-mole, raccoon, badger, wolverene, weasel, skunk, otter, seal, and walrus. Other animals met with are the opossum in all its varieties, the squirrel, marmot, mouse, beaver, porcupine, and hare; different kinds of deer, the principal of which are the moose or elk and the reindeer; the mountain-sheep, the goat, bison, musk-ox, and antelope. The boar, horse, and common ox have been imported, and become wild. Reptiles are numerous, especially in the States, and some of them dangerous, the most noted of this class being the rattlesnake. The alligator or cayman is found in some of the southern rivers. Numerous varieties of fish frequent the North American waters, including salmon, sturgeon, mackerel, shad, cod, herring, trout, pike, and many others. Birds exist in great variety, including some genera peculiar to the continent, such as the humming-bird, toucan, and wild turkey.

Races of Men.—The origin of the American race is wholly unknown, although numerous conjectures have been made upon the subject, none of which, however, can be regarded as satisfactory. Evidences, however, exist to show that America was inhabited by a people long antecedent to the present races or tribes by which the soil is occupied. The Indian tribes of America, with the exception, perhaps, of the most westerly Esquimaux, have all so strong a resemblance to each other in physical formation, and also, though in a less obvious degree, in intellectual character, as to leave no doubt of their being one family. As to their moral character, they seem to possess, excepting extraordinary powers of endurance, precisely the virtues and vices common to all savages. They are grateful, hospitable, and capable sometimes of a savage magnanimity; but they are also vindictive, cruel, and treacherous. See INDIANS (AMERI-

CAN) and ETHNOLOGY. The population of North America is estimated at 64,000,000, and with the exception of Mohammedanism, every religion on the face of the earth has its representatives here.

Political Divisions.—The great political divisions of North America, exclusive of Central America, are the United States, British America, and Mexico. The territory of the United States extends from the British possessions to Mexico and the Gulf of Mexico, and from the Atlantic to the Pacific Ocean. Alaska Territory, formerly Russian America, but sold to the United States in 1867, occupies the north-west corner of the continent. The whole of British America except Newfoundland is now included in the Dominion of Canada, which comprises Upper Canada, now the province of Ontario, Lower Canada, now the province of Quebec; and the provinces of New Brunswick, Nova Scotia (including Cape Breton Island), Prince Edward's Island, Manitoba, British Columbia (including Vancouver's Island). The North-west Territories, formerly the Hudson's Bay Territories, also belong to the Dominion.

Discovery of North America.—The first discoverer of North America was John Cabot, a native of Venice, who resided in England in the reign of Henry VII., under a patent granted by that monarch, and which included Cabot's three sons, Sebastian, Louis, and Sanchez. John Cabot, accompanied by Sebastian, sailed from Bristol, and on June 24, 1497, came in sight of North America, the coast seen being, it has been conjectured, part of Labrador. This was a year before the discovery by Columbus of South America, which took place in May, 1498. In the summer of 1498 Sebastian Cabot sailed from England with two ships, fitted out at his own and his father's expense; and, directing his course by Iceland, reached Newfoundland, which he called Terra de Baccalaos, from the native name for fish, with which the surrounding seas were filled. The next adventurer who reached the North American shores was Gaspar de Cortereal, a Portuguese nobleman, who sailed for, and subsequently surveyed between 600 and 700 miles of, the coast of Labrador in the year 1500. He returned to America shortly after; but having excited the enmity of the people by having carried off on his first voyage a number of natives as slaves, it is supposed that he and his ships' crews were destroyed, as they were never again heard of. A similar fate befell his brother, who sailed in search of him in the following year; and in 1503 another expedition, fitted out by the King of Portugal to ascertain the fate of the brothers, shared the like destiny. The Portuguese affected to consider the Cortereals as the first discoverers of Newfoundland and the adjacent coasts of North America, and attempted to establish a claim to these territories on that ground, but the evidence of their having been anticipated by the Cabots was sufficiently clear to render the attempt unavailing.

In 1512, Sebastian Cabot sailed again for America, with a small squadron under the command of Sir Thomas Pert, fitted out by Henry VIII.; but a mutiny on board his vessels, together with a want of resolution on the part of the commander, compelled him to return before more had been accomplished than a visit to Hudson's Bay In the same year Florida was discovered by Ponce de Leon. The next name that occurs in the history of American discovery is that of Giovanni Verazzano, a Florentine navigator of great skill and celebrity, who was sent out by Francis I. of France in the year 1524, and who surveyed upwards of 2000 miles of coast, comprising the whole of that of the United States, with a large portion of that of British America. Verazzano gave the name of New France to the region he had discovered. In a subsequent voyage he and his party were surrounded by the savages, and put to death. Ten years afterwards, Jacques Cartier, an enterprising seaman of St. Malo, sailed from that port for Newfoundland, the north coast of which he surveyed and minutely described. He performed several voyages afterwards, in one of which he entered the St. Lawrence, being the first European who had done so, and ascended the river as high as Montreal. An attempt was afterwards made by the Sieur de Roberval, a nobleman of Picardy, to form a settlement in America, but the attempt was unsuccessful, the only result being a fort which the French erected near the present site of Quebec, and named Charlesbourg. This fort, however, was the first European settlement formed in that part of America. Roberval and his brother sailed on another voyage of discovery some time after, and perished; neither they nor their ships having ever been again heard of. Previous to this the Spaniards had conquered Mexico, and a desire to extend their dominion in a northerly direction led to further discoveries in North America. The coast of California was discovered by Ximenes, a pilot, who, with Mendoza, a captain, whom the former murdered during the voyage, had been despatched by Cortez on a voyage of discovery. In 1539 the Gulf of California was first entered by Francisco de Ulloa, another adventurer also sent out by Cortez, who spent a year in examining its coasts and havens. The Spaniards performed several voyages afterwards, but they were unattended by any results worthy of notice till the years 1596 and 1602, when Sebastian Viscaino proceeded along the coast as far as the river Columbia. These discoveries were followed by those of Davis in 1585, Weymouth in 1602, Knight in 1606, Hudson in 1610, Button in 1612, Bylot and Baffin in 1615, from the latter of whom Baffin's Bay has been named. The first in point of time among the more modern voyagers to the shores of North America were Captain Behring, and Tchirikoff his lieutenant, both natives of Russia, who were sent out in 1725 by the Empress Catharine to survey the northern coasts. They made several important discoveries, besides setting at rest the disputed point whether Asia and America were two separate continents. In 1776 Captain Cook, accompanied by Captain Clarke, surveyed the north-west boundaries of America, tracing the coast from lat. 50° N. till he came to Cape Prince of Wales, when he steered a north-east course, till arrested by ice islands in about lat. 70° N. The remaining names associated with American maritime discovery are Meares, Vancouver, Kotzebue, and, more recently, Ross, Parry, Franklin, and Beechy; inland travellers and discoverers, Hearne, M'Kenzie, Back, Rae, and Simpson.

NORTHAMPTON, or NORTHAMPTONSHIRE, an inland county of England, bounded north and north-west by counties Lincoln, Rutland, and Leicester; west, Warwick and Oxford; and south, south-east, and east, Oxford, Bucks, Bedford, Huntingdon, and Cambridge. Area, 629,912 acres, of which in 1883, 158,445 acres were under corn crops; 38,143 acres under green crops; 34,137 under clover and grasses under rotation; and 304,654 under permanent pasture or meadow. The county is pleasantly diversified by waving hills, gentle slopes, and beautiful vales, copiously watered by numerous streams and rivulets. The highest eminences are in the south-west part of the county, on the borders of Warwick, but here the most elevated summit is only about 800 feet. The east border is occupied by the Oxford clay, the rest of the county chiefly by the uppermost formations of the lowest division of oolites. Slaty beds of the

forest marble lime, and brick clay, occur in various places. The soil is various, but mostly rich and fertile, consisting principally of various descriptions of loam. The pastures are excellent, and the cattle grazed on them in summer yield a profitable return. The principal corn crops are wheat, barley, and oats; the first in largest proportion. Beans and turnips are also extensively cultivated, and hemp is grown to some extent in the fenny district, on the borders of Lincolnshire and Cambridgeshire. The rearing of sheep is a principal object with the Northamptonshire farmers, 100,000 sheep and lambs being annually sent to London, and 15,000 head of fat cattle. In 1883 there were in the county 413,075 sheep and 117,790 cattle. Woodlands, principally the remains of ancient forests, are very extensive in this county. The chief articles of manufacture are shoes, bone-lace, and woollen stuffs. An important branch of the boot and shoe manufacture in the county consists in the making of boots and shoes for the army. Ironstone of excellent quality is found in vast beds throughout the county; and of late years this has developed into an important industry. Smelting furnaces are at work at Heyford, Hardigstone (near Northampton), Wellingborough, Finedon, and other places, whilst ironstone digging finds employment for many men from one end of the county to the other. Northamptonshire returns eight members to Parliament—four for the county, two for the city of Peterborough, and two for Northampton. Pop. in 1881, 272,555.

NORTHAMPTON, a parliamentary and municipal borough of England, capital of the county of same name, 66 miles north-west of London, on the left bank of the Nene, which is connected with the Grand Junction Canal. The London and North-Western, and Midland Railways, pass through Northampton. It consists of four principal streets, meeting in a large open market-place; and of a number of minor streets, of very irregular formation. Outside the town is the Victoria promenade, about 1 mile long, with an avenue of lime-trees. Northampton is a town of considerable antiquity, and was formerly walled and defended by a castle built soon after the Conquest, the ruins of which remain. The principal churches are All Saints', rebuilt in 1680, after the designs of Sir Christopher Wren, and possessing an ancient embattled tower, which escaped when the original building was burned down; St. Peter's, built about the same time as the castle, recently restored, and admired as one of the purest and most beautiful specimens of decorated Norman; St. Giles', with a fine Norman porch; St. Sepulchre's, said to have been built by Simon de St. Liz, on the model of the Church of the Holy Sepulchre at Jerusalem, and the Roman Catholic pro-cathedral. The other more important buildings are the town-hall, the shire or county hall, the county and borough jails, corn exchange, barracks, infirmary, theatre, &c. There are a grammar and other schools; mechanics' institute, with a library of 10,000 volumes; an athenæum, and other literary and artistic societies. The benevolent institutions include the infirmary, a lunatic asylum, the Royal Victoria Dispensary, St. John's, and Thomas-à-Becket hospitals, &c. The staple manufacture is boots and shoes for home and export trade, which employs about 12,000 hands. The currying of leather is also carried on on a large scale. There are also iron and brass foundries, breweries, and paper and corn mills. Ironstone is found in the neighbourhood, and smelting-furnaces have recently been erected. The races, held on a race-course north of the town, attract great numbers of visitors. Besides two weekly markets, there are eleven annual fairs. The cattle-market was formerly held in the market-place, but is removed to another site.

Northampton, after having been a considerable time in possession of the Danes, was burned by them in 1010. It was again nearly destroyed by the Northumbrian insurgents in 1064. Immediately after the Norman Conquest it was bestowed, as part of the earldom of Northampton, on Simon de St. Liz, who built its castle and its walls, and, by other improvements, contributed greatly to its progress. In 1258, owing to quarrels between the professors of Oxford and their students, an attempt to make Northampton the seat of a rival university obtained the sanction of the king, but was ultimately abandoned. Several synods and parliaments were afterwards held in it. In one of the latter a treaty was made, by which Edward II. formally renounced his pretensions to the sovereignty of Scotland. The other most remarkable events in its history are the battle between the Roses in 1460, in which Henry VI. was taken prisoner; a destructive flood in 1663, and a still more destructive fire in 1675, causing a damage estimated at £150,000. The borough, originally constituted by prescription, is governed by a mayor, six aldermen, and eighteen councillors, and sends two members to Parliament. Pop. in 1881 (mun. bor.), 51,881; (parl. bor.), 57,544.

NORTHAMPTON, a town in Hampshire, Massachusetts, U.S., beautifully situated on the right bank of the Connecticut, 93 miles west of Boston. It is handsomely built, and has a court-house, public library, lunatic and deaf-mute asylums, jail, and ten churches. It has important woollen, cotton, and silk factories, paper-mills, and tanneries. A bridge, 1080 feet long, across the Connecticut, connects it with Hadley. Pop. in 1880, 12,172.

NORTH BERWICK. See BERWICK (NORTH).

NORTH CAPE, a celebrated promontory, forming the most northern point of Europe, and situated on the north of the island of Magerōe, which is separated from the mainland of Sweden by a narrow channel; lat. 71° 10′ 12″ N.; lon. 25° 46′ E. It consists of a long row of precipitous rocks jutting out into the sea, and terminating above partly in pyramidal peaks and partly in a kind of table-land, at the height of about 1200 feet. It is about three-fourths of a mile across, and consists of gneiss, quartz, and other crystalline rocks. The quartz, in particular, lies strewed about in all directions, and wherever there is a flat spot reflects its dazzling whiteness; but the face of the precipices exposed to the dashing of the storm is of a dark colour, according better with the general wildness of the scene. On the west and north side the rocks of the cape are so precipitous that no boat can land; but on the east side a small bay hollowed out of the bosom of the rock gives easy access to the shore. Here, amid the surrounding sterility, marks of vegetation suddenly appear; and the forget-me-not, wild geranium, angelica, and several other plants, are seen blooming.

NORTH CAROLINA. See CAROLINA.

NORTHCOTE, JAMES, born in Plymouth in 1746, where his father was a watchmaker, who designed him for his own business, but young Northcote, having a taste for the fine arts, and being flattered by praises bestowed on his early productions, pursued the practice of drawing and painting with so much assiduity that Dr. Mudge, a physician of that town, recommended him as a scholar to Sir Joshua Reynolds. He went to London in 1771, and became domesticated with that great artist. In 1776 he quitted him, and commenced business on his own account with the full concurrence of his preceptor. He was eminently successful as a portrait-painter, his portraits having procured him both wealth and reputation. Two of his best works were for the Shakspere Gallery—the Murder of the Two Princes

iron-foundries and ship-building yards. It has a considerable shipping trade. Pop. (1880), 6617.

NORDERNEI, or NORDERNEY, a small island, now belonging to Prussia, on the coast of East Friesland, to which there is a foot-path from the continent at low tide; area, about 5 square miles. On the north-western side is a village with 700 inhabitants (mostly seamen), and an establishment for sea-bathing, much resorted to during the summer. On the south-east side are downs from 40 to 80 feet high.

NORDHAUSEN, a town, Prussian Saxony, 38 miles N.N.W. of Erfurt, at the foot of the Seyersberg, and on the Zorge and Golden Aue. It has walls flanked with towers, seven gates, two fine paintings by Lucas Cranach in one of its churches, a town-house, and gymnasium. Its manufactures are woollen and linen cloth, lacquer-ware, and chemicals. It has also extensive breweries and distilleries, and a considerable trade in corn and cattle. Pop. in 1880, 26,198.

NORDLINGEN, a town in Suabia, which in 1802 came into the possession of Bavaria. It is surrounded by walls, flanked with towers, and is entered by five gates; has a handsome Gothic cathedral, surmounted by a remarkable tower 345 feet high; manufactures of carpets, woollen and linen goods, leather, and glue; and a considerable trade in corn. The Swedes were defeated here, September 6, 1634, for the first time on German ground. (See THIRTY YEARS' WAR.) The battles of 1645, 1796, and 1800 have also contributed to make the place memorable. Pop. (1880), 7837.

NORDSTRAND, an island of Prussia, separated by a narrow channel from the south-west coast of Schleswig. The far greater part of it was swept away in 1634 by a flood, which drowned 15,000 persons, of whom 6400 belonged to Nordstrand alone, and immense numbers of cattle. A part of what escaped the waves now forms the separate islands of Pelworm and Halligen. The present area of Nordstrand does not exceed 21 square miles; formerly its area was ten times as great. Pop. about 2500.

NORE.—1. A part of the estuary of the Thames, England, about 50 miles below London, and east of Sheerness. It is encumbered with sand-banks, on one of which there is a floating light.—2. A river, Ireland, which rises in the Sliebhbloom Mountains, on the borders of Tipperary and Queen's County, flows S.S.E. through Kilkenny, Thomastown, and Inistioge, and joins the Barrow about 2 miles above New Ross. Its rapid current makes navigation difficult, but it admits vessels of considerable size as far as Inistioge, and barges to Thomastown.

NORFOLK, a maritime county of England, bounded north and north-east by the North Sea, south and south-east by Suffolk, west and north-west by Cambridge and Lincoln and the Wash. Area, 1,356,173 acres, of which about 1,200,000 acres are arable, meadow, and pasture. The surface is generally flat, with some slight swells and depressions in the north part. The coast consists principally of cliffs, partly chalk and partly alternate strata of clay, gravel, loam, and sand. These are gradually undermined by the sea, which is everywhere making inroads on the land. Several villages have been at various periods swept away, the sites they occupied now forming part of the bed of the German Ocean. These encroachments of the sea are still in progress. The general appearance of the country in Norfolk is extremely uninteresting; the undulations of the surface not being sufficient to relieve the eye, while the luxuriant effect of rich woodland is not always to be met with. But these deficiencies are compensated by the evidences of careful cultivation, and the pleasing tokens of human industry so frequently and prominently brought before the eye of the traveller. The climate on the east coast is dry throughout the year, and cold biting winds prevail during the winter and early in spring. This county has perhaps a higher reputation than any other district in England for its progress in agriculture (although numerous instances of very indifferent husbandry present themselves), yet it has nothing indigenous which commands a first-rate price in the market. The Norfolk sheep are almost superseded in their own district by the Southdown; and the fine cattle which are sent to Smithfield from this county are merely fattened here—the native breed, the 'Norfolks' or 'Home-bred's,' being held in little estimation. In 1883 there were in the county 44,232 agricultural horses, 117,497 cattle, and 559,146 sheep. In the north and west districts the soil is light and sandy; in the central and east parts generally loamy, varying in quality, being here and there stiff and difficult to manage, but mostly light and incumbent on a marly clay. Here also extensive marshes occur, some of which are peculiarly favourable for the growth of corn; but their liability to inundation has induced the inhabitants to prefer the dairy system, and in these parts large quantities of butter are made and exported under the name of 'Cambridge.' The quantity of permanent pasturage was in the year 1883, 264,943 acres, of corn crops 438,273 acres, and 202,060 acres of green crops. The crop raised in greatest perfection is barley, which, indeed, may be considered as the most important portion of the agricultural produce. Most of it is made into malt, and then shipped. Vast numbers of turkeys are reared; pheasants, partridges, and rabbits abound. The manufactures, except for home consumption, consist chiefly of woven goods, which in a variety of branches still constitute the staple trade. Norfolk has extensive fisheries of both herrings and mackerel; the former, however, being by far the most important. It returns ten members to Parliament, namely, six for the county, two for the city of Norwich, and two for the borough of King's Lynn; Thetford and Yarmouth have been disfranchised. Pop. (1871), 438,656; (1881), 444,749.

NORFOLK, a city and port in the county of the same name, Virginia, U.S., on the river Elizabeth, 32 miles from the ocean. It lies low, has irregular and crooked streets, a court-house, jail, city hall, theatre, several academies, orphan asylum, mechanics' hall; and in the vicinity a marine hospital and a navy-yard, with a dry dock, constructed of hewn granite; and 26 churches. The harbour is safe and commodious. It has a greater foreign commerce than any other place in the state. Pop. in 1880, 21,966.

NORFOLK, DUKE OF. See HOWARD (THOMAS).

NORFOLK ISLAND, in the South Pacific, in lat. 28° 58′ S., and lon. 167° 46′ E., about 400 miles north-west of New Zealand. It is about 6 miles long by 4 broad, and has a bold rocky shore without harbour or roadstead, but a fertile soil and luxuriant vegetation, and a delightful and salubrious climate, producing wheat and maize in great abundance. It was discovered by Captain Cook in 1774, when it was uninhabited. In 1789 a British settlement was formed here from Sidney, but it was afterwards made a penal settlement until the transportation system was abolished. It was then, in 1857, assigned to the Pitcairn Islanders for their residence.

NORICUM was, among the Romans, that part of the south of Germany which is situated between the Save, the Lake Pelso, Rhætia, Vindelicia, and the Danube; but its boundaries were not the same at all times. The Celts inhabited this country.

NORMAL. The straight line drawn from any point in a curve in its plane at right angles to the

tangent at that point is a normal to the curve. The straight line drawn from any point in a surface, at right angles to the tangent plane at that point is a normal to the surface. The section of a surface by a plane containing a normal drawn from any point is called the 'normal section' at that point.

NORMAL SCHOOLS, called also TRAINING COLLEGES, institutions established for the express purpose of giving instruction in the principles and art of teaching. So much depends upon the fitness of a teacher for his work, that the necessity of special preparation for it is almost universally admitted, though only at a comparatively recent date were steps taken to afford means for the due qualification of teachers. This means is now furnished by the normal schools. The name is derived from the French *écoles normales*, established with the same object at the close of last century. The aim of these schools is not so much to teach the sciences—although this is not neglected—as to teach the students the art of teaching others. Not only must the student, on leaving the normal school, be well instructed himself, but he must be capable of communicating instruction to others. In most of the principal countries of Europe, and in America, normal schools, or institutions with similar aims, have been established. Among the earliest in Great Britain was the General Assembly's Normal Institution, founded in 1830.

NORMAN ARCHITECTURE. See ARCHITECTURE—Romanesque Style.

NORMANDY, an ancient province in the north of France, bounded north and west by the English Channel, east by Picardy and Isle of France, south by Maine and Brittany; greatest length, about 150 miles; breadth, 75 miles; area, 10,500 square miles. On the decline of the Roman Empire it was seized by the Franks, and afterwards, in the tenth century, wrested from them by the Normans, from whom it has derived its name. By the Treaty of St. Claire-sur-Epte Charles the Simple gave his sanction to the conquests made by the Normans, and Rollo, their chief, received the title of Duke of Normandy. William the Bastard, sixth in succession from Rollo, having conquered England and ascended its throne in 1066, Normandy became annexed to England. On the death of William the Conqueror it was separated from England, and ruled by his son Robert, and was afterwards ruled by the kings of England until Philip Augustus wrested it from John, and united it to France in 1203. After this it was several times invaded by the English, but finally recovered by the French, in 1450. Normandy was divided into Upper and Lower Normandy; Rouen was the capital of the former, Caen of the latter. It now forms five departments—Seine-Inférieure, Eure, Calvados, Manche, and Orne, with the exception of arrondissement Mortagne. It is one of the richest and most fertile parts of France. The inhabitants are distinguished for intelligence and shrewdness. (See NORTHMEN.) Normandy holds a good position in the French literary world. The Norman trouvères in ancient times ranked high as poets; and in modern times men like Corneille, Malherbe, Bernardin de St. Pierre, La Place, and others, have sustained its early renown.

NORMANS. See NORMANDY and NORTHMEN.

NORRIS, EDWIN, an eminent English linguist, and one of the founders of Assyriology, was born October 24, 1795. He passed several years of his youth on the Continent as a private tutor, and was afterwards appointed to a clerkship in the India House. He subsequently became one of the interpreters to the foreign office, and for his services in this capacity received a small pension. For more than twenty-five years he discharged the duties of secretary to the Asiatic Society. His connection with this society encouraged him to prosecute his philological studies with increased zeal. In 1846 his attention was turned to the study of cuneiform writing by Sir Henry Rawlinson's copy and analysis of the great cuneiform record of Darius Hystaspes, at Behistun in Persia, which he superintended in its course through the press, and he soon began to be regarded by oriental scholars as one of the chief authorities in cuneiform philology. Besides rendering essential service to Sir H. Rawlinson in other publications, he assisted him in publishing for the British Museum two volumes of cuneiform inscriptions. The great work, however, of Norris is his Assyrian Dictionary (1868–72), in three volumes, which, though incomplete, marks an epoch in cuneiform studies. The Celtic dialects also received a considerable share of his attention; in 1859 he published the text and translation of three Cornish dramas, in two volumes. Other publications of his which may be mentioned are A Specimen of the Vai Language of West Africa (1851); A Grammar of the Bornu or Kanuri Language (1853); and Dialogues and a Small Portion of the New Testament in the English, Arabic, Haussa, and Bornu Languages (1853). Norris died on the 10th Dec. 1872.

NORRISTOWN, a town, United States, Pennsylvania, on the Schuylkill, here crossed by a bridge 800 feet long, 16 miles N.W. of Philadelphia. It has spacious, well-built streets, Episcopal, Presbyterian, and Catholic churches, several schools, a fine court-house, a public library; several extensive woollen and cotton factories, rolling-mills, foundries, flour-mills, glass works, and other establishments. Pop. in 1880, 13,063.

NORRKÖPING, a town of Sweden, 24 miles north-east of Linköping, at the mouth of the Motala Elf in the Bravik, a gulf of the Baltic. The environs are beautiful, and the site of the town is one of the finest in the kingdom. The Motala Elf flows through the town, making several falls within it, and forming two islands, and is crossed by several bridges. It is well and regularly built, and has important manufactures of linen, hosiery, starch, lacquerware, soap, and tobacco; oil, paper, and other mills; sugar-refineries, and building-yards, at which a number of handsome steamers have been fitted out. Pop. (1880), 26,735.

NORTE, RIO GRANDE DEL, a river of Mexico, which rises in the Rocky Mountains, near the sources of the Arkansas, about lat. 41° N., runs S.S.E., and empties itself into the Gulf of Mexico, lon. 96° 40′ W.; lat. 26° N. It serves but little the purposes of navigation, owing to the sand-bars in the flat country and the rapids in the upper part. Its mouth is 1200 feet wide, but is barred so as to afford entrance only to boats, which, however, can ascend to Paso del Norte, lat. 32° 9′ N., where rapids and shoals commence. Length, about 2000 miles.

NORTH, FREDERICK, LORD, Earl of Guildford, an English statesman, was the eldest son of Francis, second earl of Guildford, and was born in 1732. He received his education at Eton School and Trinity College, Oxford, after which he passed some time at Leipzig. Returning to England, he obtained a seat in the House of Commons, and in 1759 was appointed a commissioner of the treasury. On the resignation of Lord Bute, in 1763, he was made head of that board, which post he held till 1765; and the next year he was made joint receiver and paymaster of the forces. At length, in 1767, he became chancellor of the exchequer, and in 1770 first lord of the treasury. His administration lasted till 1782, during a period of peculiar difficulty and danger. Having accepted of office at a time when the court party had become unpopular, on account of the secret influence supposed to be possessed by Lord Bute, something

of that unpopularity attached to the whole course of Lord North's ministry. But this was greatly augmented by the contest with the North American colonies, which ended in the loss of that part of the British Empire, after the expenditure of a vast deal of the national wealth, and the sacrifice of multitudes of lives. For this disastrous measure of subjugating America the premier appears to have been a sincere advocate; and in defending his proceedings against the attacks of Mr. Fox and his party, in Parliament, he evinced a degree of political skill and resolution which would have done honour to a better cause. After losing office a league was formed between his lordship and the Whigs, which led to the famous coalition ministry; but this heterogeneous administration lasted only a few months, after which Lord North held no responsible station in the state. He succeeded to the earldom of Guildford in 1790, on the death of his father, and died in 1792, having been afflicted with blindness several years before his death.

NORTH ADAMS, a town of the United States, Berkshire county, Massachusetts, on the Hoosac river, near the west end of the great Hoosac tunnel, 20 miles N.N.E. of Pittsfield, situated among lofty hills and fine scenery. The manufactures, which form the leading interest of the place, consist of cotton and woollen goods (the produce of about twenty factories), boots, shoes, paper, nitro-glycerine, and other articles. In the boot and shoe trade a considerable number of Chinese are employed. There are about 20 churches, several large hotels, banking establishments, &c. In the vicinity are the Sand Springs, a popular place of summer resort. The Pittsfield and North Adams, and the Troy and Boston railways terminate here. Pop. in 1880, 10,191.

NORTHALLERTON, a parliamentary borough of England, Yorkshire, in the North Riding, 32 miles N.N.E. of York, on the North-Eastern Railway. It consists of one long and spacious street, with a few smaller back ones; and has a parish church recently restored, several other places of worship; a town-hall, court-house, prison, several charitable institutions, &c. The inhabitants are chiefly engaged in agriculture, and some tanning and currying are carried on. It sends a member to Parliament. Pop. in 1881, 5445.

NORTH AMERICA, the northern half of the western continent, or New World, extends from the 15th degree of north latitude, measuring from the most southerly point of Mexico, to the Arctic Ocean, and from 55° 30′ to 168° w. lon. It is bounded on the north by the Arctic Ocean, on the east by the Atlantic Ocean and the Gulf of Mexico, on the south by Central America and the Gulf of Mexico, and on the west by the Pacific Ocean. Its length, from Hudson's Straits to the Florida Channel, is 4800 miles, and from the latter along the inland sea to Panama, about 4500. The more remarkable of its coast indentations and inlets are Baffin's Bay, Hudson's Bay, and the Gulf of St. Lawrence on the east coast, the Gulf of Mexico on the south, and the Gulfs of California, Georgia, and Cook's Inlet on the west. Two extensive mountain chains run near and parallel, the one to its east, the other to its west coast; and a vast plain lying between these chains extends north and south from the Arctic Ocean to the Gulf of Mexico. In this plain are situated the great lakes of North America. Other remarkable physical features of this continent are its sandy deserts, extending along the base of the Rocky Mountains to the 41st degree of north latitude, and having a breadth averaging from 400 to 600 miles; its steppes in the northern regions of the continent; its prairies and marshes, the former being peculiar characteristics of North America, and occurring chiefly in the Mississippi valley. These prairies or savannahs consist of extensive, elevated, and generally irregular tracts without trees, though sometimes capable of producing them, covered in the spring with long grass intermingled with fragrant flowers.

Mountains.—Of these there are two principal systems in North America, the Rocky Mountains in the west, and the Alleghanies or Appalachian Mountains near the east coast. The Rocky Mountains, including under that name the whole of the great elevated belt of mountain chains and plateaus running northward from the south of Mexico to the Polar Sea, form the back-bone of the continent, and one of the greatest mountain systems on the globe. The Rocky Mountains may be looked upon as a continuation of the Andes, which they almost equal in length, and greatly exceed in mass from their much greater breadth. This mountain system, where it is most fully developed, may be divided into three chief regions—on the east the double chain of the Rocky Mountains proper, then a region of lofty, broken, and irregular table-lands, and on the west a very high and irregular mountain chain, which includes the Pacific Alps of the north-west, the Cascade Range in British Columbia and the north-west of the United States, the Sierra Nevada of California, and the Peninsular chain of California. The highest part is between lat. 42° and 53° N., where several peaks rise far above the snow-line, Mount Hooker attaining an elevation of 15,700 feet, and Mount Brown 15,990 feet. Further north they decrease to 4000 and 2000 feet. The Appalachian mountain system stretches from Georgia and Alabama in the south-west to the Gulf of St. Lawrence in the north-east, and we may even include in it the Watchish or Wotchish Mountains of Labrador. In the north-east it comprehends the Green Mountains, the White Mountains, and the Adirondack group; from Pennsylvania southward Alleghany Mountains is the name that strictly belongs to it. The Alleghanies consist chiefly of four separate groups crossing the country in the same general direction from north-east to south-west. Their mean elevation does not exceed 2500 feet. The highest summits of the Appalachian system are Mount Mitchell in North Carolina, 6470 feet, and Mount Washington in New Hampshire, 6226 feet.

Rivers and Lakes.—The principal rivers are the Missouri-Mississippi and the St. Lawrence. The former has its origin in the Rocky Mountains, at about lat. 45° 20′ N.; lon. 110° 30′ W., by the junction of three streams, and falls into the sea in the Gulf of Mexico in lat. 27° N., traversing in its course a distance estimated at upwards of 4400 miles. It has obtained its double name from the Missouri forming about two-thirds of its earlier course. The St. Lawrence rises under the name of the St. Louis in lat. 47° 45′ N.; lon. 93° W.; flows north-east by north, and falls into the Gulf of St. Lawrence. It is more than 100 miles wide at the mouth. The Arkansas, Red River, and Ohio, are all tributaries of the Mississippi, and have their sources in the Rocky Mountains. The Rio Grande del Norte has also its source in the Rocky Mountains, and falls into the Gulf of Mexico. The Mackenzie issues from the Great Slave Lake, and flowing northward, falls into the Arctic Sea. The Columbia and the Colorado are the only large rivers on the western declivity of the Rocky Mountains. The Yukon, which falls into Behring's Sea, and has the principal part of its course in Alaska Territory, is also a large river; as is likewise the Saskatchewan, which enters Lake Winipeg, its waters being conveyed to Hudson's Bay by the Nelson.

In the number and the magnitude of its lakes, and in the internal means of commercial intercourse afforded by these, North America is unequalled by any

ARCTIC OCEAN
ASIA
ALASKA
United States Territory
Behring Strait
Arctic Circle
GREENLAND
ICELAND
BAFFIN BAY
Baffin Land
Melville Sound
Parry Islands
Hayes Peninsula
Grant L.
Lady Franklin Bay
Disco I.
DAVIS STRAIT
Fax Channel
Fox Land
Hall Penin.
Southampton Isl.
Hudson Strait
HUDSON BAY
LABRADOR
Great Bear Lake
Great Slave Lake
Athabasca L.
Lake Winnipeg
Lake Superior
Lake Michigan
Lake Huron
Lake Erie
Lake Ontario
ATHABASCA
DOMINION OF CANADA
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
ASSINIBOIA
MANITOBA
ONTARIO
QUEBEC
NEW BRUNSWICK
NOVA SCOTIA
NEWFOUNDLAND
MONTANA
NORTH DAKOTA
MINNESOTA
Queen Charlotte Islands
Vancouver I.
Victoria
Winnipeg
Montreal
Ottawa
Halifax
C. Sable
St. John
C. Race
Cape Breton I.
Gulf of St. Lawrence
Hebron
Okkak
Nain
Hopedale
Ungava Bay
Fort Simpson
Fort Norman
Fort Resolution
Fort Rae
Fort Liard
Fort Providence
Fort Reliance
Fort Chipewyan
Fort Wrigley
Fort Simpson
Fort Nelson
Fort Vermilion
Fort Dunvegan
Fort Assiniboia
Fort Ellice
Fort Pelly
Fort Carlton
Fort Edmonton
Fort Pitt
Fort Battleford
Fort Macleod
Fort Calgary
Fort Whoop-up
Fort Walsh
Fort Qu'Appelle
Fort Garry
Fort Alexander
Fort Frances
Fort William
Fort Wellington
Fort Prince of Wales
Fort Churchill
Fort York
Fort Severn
Fort Albany
Fort Moose
Fort Abitibi
Fort Temiscamingue
Fort Coulonge
Fort Wentworth
Fort Kamloops
Fort Hope
Fort Yale
Fort Langley
Fort Simpson
Fort Rupert
Fort Victoria
Fort Stikine
Fort Selkirk
Fort Yukon
Fort Hamilton
Fort Good Hope
Fort Anderson
Fort Macpherson
Fort Norman
Fort Simpson
Fort Wrigley
Fort Nelson
Fort Liard
Fort Providence
Fort Resolution
Fort Rae
Fort Reliance
Fort Chipewyan
Fort Vermilion
Fort Dunvegan
Fort Assiniboia
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Fort Temiscamingue
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Fort Wentworth
Fort Kamloops
Fort Hope
Fort Yale
Fort Langley
Fort Simpson
Fort Rupert
Fort Victoria
Fort Stikine
Fort Selkirk
Fort Yukon
Fort Hamilton
Fort Good Hope
Fort Anderson
Fort Macpherson

NORTH AMERICA
BY J. BARTHOLOMEW, F.R.G.S.
British Miles
Kilometres
Longitude West 100 from Greenwich.
GULF OF MEXICO
CARIBBEAN SEA
PACIFIC OCEAN
ATLANTIC OCEAN
CENTRAL AMERICA
SOUTH AMERICA
WEST INDIA ISLANDS
Bahama Islands
Greater Antilles
Lesser Antilles
Tropic of Cancer
Isthmus of Tehuantepec
Gulf of Tehuantepec
Bay of Campeachy
Bay of Honduras
Gulf of California
Lower California
Revillagigedo Is.
MEXICO
TEXAS
Indian Territory
ARIZONA
NEW MEXICO
KANSAS
HAVANNAH
JAMAICA
HAYTI
Porto Rico
Dominica
GUATEMALA
HONDURAS
NICARAGUA
Yucatan
Campeachy
Belize
Guatemala
Salvador
Mexico
Puebla
Vera Cruz
Tampico
Monterey
Matamoras
Brownsville
New Orleans
Galveston
Austin C.
Santa Fé
Chihuahua
Durango
Mazatlan
La Paz
Guadalajara
Zacatecas
San Luis Potosi
Acapulco
Oaxaca
Merida
Havana
Key West
C. Hatteras
Charleston
Savannah
Mobile
Montgomery
Atlanta
Nashville
Louisville
Richmond
Washington
Baltimore
Philadelphia
New York
Boston
Bermudas I.
Cuba I.
Jamaica
Panama
C. of Panama
Gulf of Darien
Gulf of Venezuela
Gulf of Maracaibo
Caribbean Sea
Longitude West 100 from Greenwich.
BLACKIE & SON GLASGOW, EDINBURGH & LONDON.

other continent. Lakes Superior, Michigan, Huron, Ontario, and Erie together cover an area of 90,700 square miles. The largest, Lake Superior, averages in length 400 miles, and in breadth 80. Following the chain of lakes which crosses the country in a north-westerly direction there occur Lakes Winnipeg, Woolaston, Deer Lake, Athabasca, Great Slave Lake, and Great Bear Lake.

Islands.—In the Atlantic Ocean the principal are Newfoundland, Anticosti, Prince Edward's Island, and Cape Breton, all at the mouth of the St. Lawrence; the Bahama Islands, off the peninsula of Florida and the Gulf Stream, and some of the other West India Islands may also be said to belong to it. On the north-west coast the principal islands are Vancouver's Island, with an area of 30,000 square miles; further north, Queen Charlotte's Island; then King George III.'s Archipelago, which contains, besides a number of small islands, Prince of Wales Island, Sitka Island, and Admiralty Island. Next follow the Aleutian Islands, stretching west from the peninsula of Aliaska. In Behring's Straits are the group of Pribylof and Nounivok, belonging to Russia. In the Arctic Ocean there are a vast number of islands of which little comparatively is yet known. Besides these there is a multitude of small islands and rocks scattered along the west coast, particularly between San Francisco and Cape St. Lucas, at the south extremity of the Californian peninsula.

Geology, Mineralogy, &c.—A remarkable analogy exists in the structure of the land in North America and Central and Northern Europe. Gneiss, mica schist, and granite prevail over wide areas in the Alleghanies; on the Atlantic slope and the northern and middle latitudes of the American continent the Silurian strata extend over 2000 miles. Crystalline and Silurian rocks form the substratum of Mexico, for the most part covered with plutonic and volcanic formations and secondary limestone. The Rocky Mountains are mostly Silurian, except the eastern ridge, which is of stratified crystalline rocks, amygdaloid, and ancient volcanic productions. The coast chain has the same character, with immense tracts of volcanic rocks both ancient and modern, especially obsidian. In North America volcanic action is entirely confined to the coast and high land along the Pacific. The principal minerals are gold, silver, copper, iron, lead, and coal. The first three are found in greatest abundance in Mexico; but since 1848 the great gold-field has been California, and one or two of the other western states, where large quantities have been obtained. The coal-fields of North America are of prodigious extent, the Appalachian stretching without interruption 720 miles, with a maximum breadth of 280, and occupying an area of 63,000 square miles. The Pittsburgh seam, 10 feet thick, is 225 miles in length and 100 in breadth, and covers an area of 14,000 square miles. Other extensive fields exist throughout the country. Iron is worked in many parts of the States. Salt is likewise widely diffused.

Climate.—The predominating character of the climate of North America is intense cold, although over a great part of it an oppressive heat prevails during a portion of the summer. In British America the thermometer rises in July 20° higher than in London. Above the 50th degree of latitude the cold is so severe as to render the country all but uninhabitable, while frosts occasionally occur as low down as the 30th degree of latitude. In winter a keen and piercing north-west wind prevails throughout all North America, adding greatly to the rigour of the northern climate, and carrying its chilling influences into the more southerly regions. The transitions from cold to hot, or from winter to summer, are very sudden, especially in Canada, where there is little or no spring.

Vegetation.—The forests of North America are of vast extent, and the individual trees of the most magnificent dimensions, some of the former covering an area of 60,000 square miles, and many of the latter attaining a height of 200 and 300 feet, with a circumference of 80 feet. The forests of Canada consist chiefly of pines, oak, ash, hickory, red beech, birch, and the lofty Canadian poplar; those of the United States of sycamore, chestnut, black walnut, hickory, maple, white cedar, wild cherry, red birch, locust-tree, oak, ash, &c., and the tulip-tree, the pride of the American forest. The Arctic flora of America has much the same character with that of Europe and Asia.

Maize or indian-corn, the only important farinaceous plant peculiar to the New World, has a very extensive range in North America, although a strong heat of considerable duration is necessary to its successful cultivation. Millet, cocoa, pimento, vanilla, copäiba, chinchona, jalap, sassafras, nux vomica, tobacco, and the cochineal plant (*Cactus cochinilifer*), &c., are also indigenous. So likewise is the potato, now so widely diffused throughout Europe. Wheat, barley, oats, pease, and rice succeed well throughout large portions of the continent; so also do various kinds of fruit-trees, such as oranges, peaches, lemons, and apples, but the native fruits are mostly of the nut kind. Sugar, coffee, and cotton are amongst its staple vegetable productions. The vine has in recent times been successfully cultivated in some parts of the continent.

Zoology.—North America furnishes numerous specimens of vertebrated animals, some of these being distinguished for their ferocity. The polar and grizzly bears are the most remarkable of this class. Of the Carnivora the principal are the various kinds of bears, dogs, wolves, foxes, the panther, lynx, and wild-cat, with the hedgehog, shrew, shrew-mole, raccoon, badger, wolverene, weasel, skunk, otter, seal, and walrus. Other animals met with are the opossum in all its varieties, the squirrel, marmot, mouse, beaver, porcupine, and hare; different kinds of deer, the principal of which are the moose or elk and the reindeer; the mountain-sheep, the goat, bison, musk-ox, and antelope. The boar, horse, and common ox have been imported, and become wild. Reptiles are numerous, especially in the States, and some of them dangerous, the most noted of this class being the rattlesnake. The alligator or cayman is found in some of the southern rivers. Numerous varieties of fish frequent the North American waters, including salmon, sturgeon, mackerel, shad, cod, herring, trout, pike, and many others. Birds exist in great variety, including some genera peculiar to the continent, such as the humming-bird, toucan, and wild turkey.

Races of Men.—The origin of the American race is wholly unknown, although numerous conjectures have been made upon the subject, none of which, however, can be regarded as satisfactory. Evidences, however, exist to show that America was inhabited by a people long antecedent to the present races or tribes by which the soil is occupied. The Indian tribes of America, with the exception, perhaps, of the most westerly Esquimaux, have all so strong a resemblance to each other in physical formation, and also, though in a less obvious degree, in intellectual character, as to leave no doubt of their being one family. As to their moral character, they seem to possess, excepting extraordinary powers of endurance, precisely the virtues and vices common to all savages. They are grateful, hospitable, and capable sometimes of a savage magnanimity; but they are also vindictive, cruel, and treacherous. See INDIANS (AMERI-

CAN) and ETHNOLOGY. The population of North America is estimated at 64,000,000, and with the exception of Mohammedanism, every religion on the face of the earth has its representatives here.

Political Divisions.—The great political divisions of North America, exclusive of Central America, are the United States, British America, and Mexico. The territory of the United States extends from the British possessions to Mexico and the Gulf of Mexico, and from the Atlantic to the Pacific Ocean. Alaska Territory, formerly Russian America, but sold to the United States in 1867, occupies the north-west corner of the continent. The whole of British America except Newfoundland is now included in the Dominion of Canada, which comprises Upper Canada, now the province of Ontario, Lower Canada, now the province of Quebec; and the provinces of New Brunswick, Nova Scotia (including Cape Breton Island), Prince Edward's Island, Manitoba, British Columbia (including Vancouver's Island). The North-west Territories, formerly the Hudson's Bay Territories, also belong to the Dominion.

Discovery of North America.—The first discoverer of North America was John Cabot, a native of Venice, who resided in England in the reign of Henry VII., under a patent granted by that monarch, and which included Cabot's three sons, Sebastian, Louis, and Sanchez. John Cabot, accompanied by Sebastian, sailed from Bristol, and on June 24, 1497, came in sight of North America, the coast seen being, it has been conjectured, part of Labrador. This was a year before the discovery by Columbus of South America, which took place in May, 1498. In the summer of 1498 Sebastian Cabot sailed from England with two ships, fitted out at his own and his father's expense; and, directing his course by Iceland, reached Newfoundland, which he called Terra de Baccalaos, from the native name for fish, with which the surrounding seas were filled. The next adventurer who reached the North American shores was Gaspar de Cortereal, a Portuguese nobleman, who sailed for, and subsequently surveyed between 600 and 700 miles of, the coast of Labrador in the year 1500. He returned to America shortly after; but having excited the enmity of the people by having carried off on his first voyage a number of natives as slaves, it is supposed that he and his ships' crews were destroyed, as they were never again heard of. A similar fate befell his brother, who sailed in search of him in the following year; and in 1503 another expedition, fitted out by the King of Portugal to ascertain the fate of the brothers, shared the like destiny. The Portuguese affected to consider the Cortereals as the first discoverers of Newfoundland and the adjacent coasts of North America, and attempted to establish a claim to these territories on that ground, but the evidence of their having been anticipated by the Cabots was sufficiently clear to render the attempt unavailing.

In 1512, Sebastian Cabot sailed again for America, with a small squadron under the command of Sir Thomas Pert, fitted out by Henry VIII.; but a mutiny on board his vessels, together with a want of resolution on the part of the commander, compelled him to return before more had been accomplished than a visit to Hudson's Bay In the same year Florida was discovered by Ponce de Leon. The next name that occurs in the history of American discovery is that of Giovanni Verazzano, a Florentine navigator of great skill and celebrity, who was sent out by Francis I. of France in the year 1524, and who surveyed upwards of 2000 miles of coast, comprising the whole of that of the United States, with a large portion of that of British America. Verazzano gave the name of New France to the region he had discovered. In a subsequent voyage he and his party were surrounded by the savages, and put to death. Ten years afterwards, Jacques Cartier, an enterprising seaman of St. Malo, sailed from that port for Newfoundland, the north coast of which he surveyed and minutely described. He performed several voyages afterwards, in one of which he entered the St. Lawrence, being the first European who had done so, and ascended the river as high as Montreal. An attempt was afterwards made by the Sieur de Roberval, a nobleman of Picardy, to form a settlement in America, but the attempt was unsuccessful, the only result being a fort which the French erected near the present site of Quebec, and named Charlesbourg. This fort, however, was the first European settlement formed in that part of America. Roberval and his brother sailed on another voyage of discovery some time after, and perished; neither they nor their ships having ever been again heard of. Previous to this the Spaniards had conquered Mexico, and a desire to extend their dominion in a northerly direction led to further discoveries in North America. The coast of California was discovered by Ximenes, a pilot, who, with Mendoza, a captain, whom the former murdered during the voyage, had been despatched by Cortez on a voyage of discovery. In 1539 the Gulf of California was first entered by Francisco de Ulloa, another adventurer also sent out by Cortez, who spent a year in examining its coasts and havens. The Spaniards performed several voyages afterwards, but they were unattended by any results worthy of notice till the years 1596 and 1602, when Sebastian Viscaino proceeded along the coast as far as the river Columbia. These discoveries were followed by those of Davis in 1585, Weymouth in 1602, Knight in 1606, Hudson in 1610, Button in 1612, Bylot and Baffin in 1615, from the latter of whom Baffin's Bay has been named. The first in point of time among the more modern voyagers to the shores of North America were Captain Behring, and Tchirikoff his lieutenant, both natives of Russia, who were sent out in 1725 by the Empress Catharine to survey the northern coasts. They made several important discoveries, besides setting at rest the disputed point whether Asia and America were two separate continents. In 1776 Captain Cook, accompanied by Captain Clarke, surveyed the north-west boundaries of America, tracing the coast from lat. 50° N. till he came to Cape Prince of Wales, when he steered a north-east course, till arrested by ice islands in about lat. 70° N. The remaining names associated with American maritime discovery are Meares, Vancouver, Kotzebue, and, more recently, Ross, Parry, Franklin, and Beechy; inland travellers and discoverers, Hearne, M'Kenzie, Back, Rae, and Simpson.

NORTHAMPTON, or NORTHAMPTONSHIRE, an inland county of England, bounded north and north-west by counties Lincoln, Rutland, and Leicester; west, Warwick and Oxford; and south, south-east, and east, Oxford, Bucks, Bedford, Huntingdon, and Cambridge. Area, 629,912 acres, of which in 1883, 158,445 acres were under corn crops; 38,143 acres under green crops; 34,137 under clover and grasses under rotation; and 304,654 under permanent pasture or meadow. The county is pleasantly diversified by waving hills, gentle slopes, and beautiful vales, copiously watered by numerous streams and rivulets. The highest eminences are in the south-west part of the county, on the borders of Warwick, but here the most elevated summit is only about 800 feet. The east border is occupied by the Oxford clay, the rest of the county chiefly by the uppermost formations of the lowest division of oolites. Slaty beds of the

forest marble lime, and brick clay, occur in various places. The soil is various, but mostly rich and fertile, consisting principally of various descriptions of loam. The pastures are excellent, and the cattle grazed on them in summer yield a profitable return. The principal corn crops are wheat, barley, and oats; the first in largest proportion. Beans and turnips are also extensively cultivated, and hemp is grown to some extent in the fenny district, on the borders of Lincolnshire and Cambridgeshire. The rearing of sheep is a principal object with the Northamptonshire farmers, 100,000 sheep and lambs being annually sent to London, and 15,000 head of fat cattle. In 1883 there were in the county 413,075 sheep and 117,790 cattle. Woodlands, principally the remains of ancient forests, are very extensive in this county. The chief articles of manufacture are shoes, bone-lace, and woollen stuffs. An important branch of the boot and shoe manufacture in the county consists in the making of boots and shoes for the army. Ironstone of excellent quality is found in vast beds throughout the county; and of late years this has developed into an important industry. Smelting furnaces are at work at Heyford, Hardigstone (near Northampton), Wellingborough, Finedon, and other places, whilst ironstone digging finds employment for many men from one end of the county to the other. Northamptonshire returns eight members to Parliament—four for the county, two for the city of Peterborough, and two for Northampton. Pop. in 1881, 272,555.

NORTHAMPTON, a parliamentary and municipal borough of England, capital of the county of same name, 66 miles north-west of London, on the left bank of the Nene, which is connected with the Grand Junction Canal. The London and North-Western, and Midland Railways, pass through Northampton. It consists of four principal streets, meeting in a large open market-place; and of a number of minor streets, of very irregular formation. Outside the town is the Victoria promenade, about 1 mile long, with an avenue of lime-trees. Northampton is a town of considerable antiquity, and was formerly walled and defended by a castle built soon after the Conquest, the ruins of which remain. The principal churches are All Saints', rebuilt in 1680, after the designs of Sir Christopher Wren, and possessing an ancient embattled tower, which escaped when the original building was burned down; St. Peter's, built about the same time as the castle, recently restored, and admired as one of the purest and most beautiful specimens of decorated Norman; St. Giles', with a fine Norman porch; St. Sepulchre's, said to have been built by Simon de St. Liz, on the model of the Church of the Holy Sepulchre at Jerusalem, and the Roman Catholic pro-cathedral. The other more important buildings are the town-hall, the shire or county hall, the county and borough jails, corn exchange, barracks, infirmary, theatre, &c. There are a grammar and other schools; mechanics' institute, with a library of 10,000 volumes; an athenæum, and other literary and artistic societies. The benevolent institutions include the infirmary, a lunatic asylum, the Royal Victoria Dispensary, St. John's, and Thomas-à-Becket hospitals, &c. The staple manufacture is boots and shoes for home and export trade, which employs about 12,000 hands. The currying of leather is also carried on on a large scale. There are also iron and brass foundries, breweries, and paper and corn mills. Ironstone is found in the neighbourhood, and smelting-furnaces have recently been erected. The races, held on a race-course north of the town, attract great numbers of visitors. Besides two weekly markets, there are eleven annual fairs. The cattle-market was formerly held in the market-place, but is removed to another site.

Northampton, after having been a considerable time in possession of the Danes, was burned by them in 1010. It was again nearly destroyed by the Northumbrian insurgents in 1064. Immediately after the Norman Conquest it was bestowed, as part of the earldom of Northampton, on Simon de St. Liz, who built its castle and its walls, and, by other improvements, contributed greatly to its progress. In 1258, owing to quarrels between the professors of Oxford and their students, an attempt to make Northampton the seat of a rival university obtained the sanction of the king, but was ultimately abandoned. Several synods and parliaments were afterwards held in it. In one of the latter a treaty was made, by which Edward II. formally renounced his pretensions to the sovereignty of Scotland. The other most remarkable events in its history are the battle between the Roses in 1460, in which Henry VI. was taken prisoner; a destructive flood in 1663, and a still more destructive fire in 1675, causing a damage estimated at £150,000. The borough, originally constituted by prescription, is governed by a mayor, six aldermen, and eighteen councillors, and sends two members to Parliament. Pop. in 1881 (mun. bor.), 51,881; (parl. bor.), 57,544.

NORTHAMPTON, a town in Hampshire, Massachusetts, U.S., beautifully situated on the right bank of the Connecticut, 93 miles west of Boston. It is handsomely built, and has a court-house, public library, lunatic and deaf-mute asylums, jail, and ten churches. It has important woollen, cotton, and silk factories, paper-mills, and tanneries. A bridge, 1080 feet long, across the Connecticut, connects it with Hadley. Pop. in 1880, 12,172.

NORTH BERWICK. See BERWICK (NORTH).

NORTH CAPE, a celebrated promontory, forming the most northern point of Europe, and situated on the north of the island of Mageröe, which is separated from the mainland of Sweden by a narrow channel; lat. 71° 10′ 12″ N.; lon. 25° 46′ E. It consists of a long row of precipitous rocks jutting out into the sea, and terminating above partly in pyramidal peaks and partly in a kind of table-land, at the height of about 1200 feet. It is about three-fourths of a mile across, and consists of gneiss, quartz, and other crystalline rocks. The quartz, in particular, lies strewed about in all directions, and wherever there is a flat spot reflects its dazzling whiteness; but the face of the precipices exposed to the dashing of the storm is of a dark colour, according better with the general wildness of the scene. On the west and north side the rocks of the cape are so precipitous that no boat can land; but on the east side a small bay hollowed out of the bosom of the rock gives easy access to the shore. Here, amid the surrounding sterility, marks of vegetation suddenly appear; and the forget-me-not, wild geranium, angelica, and several other plants, are seen blooming.

NORTH CAROLINA. See CAROLINA.

NORTHCOTE, JAMES, born in Plymouth in 1746, where his father was a watchmaker, who designed him for his own business, but young Northcote, having a taste for the fine arts, and being flattered by praises bestowed on his early productions, pursued the practice of drawing and painting with so much assiduity that Dr. Mudge, a physician of that town, recommended him as a scholar to Sir Joshua Reynolds. He went to London in 1771, and became domesticated with that great artist. In 1776 he quitted him, and commenced business on his own account with the full concurrence of his preceptor. He was eminently successful as a portrait-painter, his portraits having procured him both wealth and reputation. Two of his best works were for the Shakspere Gallery—the Murder of the Two Princes

in the Tower, and Hubert and Arthur. He wrote various papers in a work called the Artist. He also published Memoirs of Sir Joshua Reynolds, comprising Anecdotes of his Contemporaries (1813), and a Supplement (in 1815); and Memoirs of Titian (1830), in which he was assisted by Hazlitt. He died July 13, 1831.

NORTH-EAST and NORTH-WEST PASSAGE. See NORTH POLAR EXPEDITIONS.

NORTHERN LIGHTS. See AURORA BOREALIS.

NORTHERN LITERATURE. See SCANDINAVIA—Literature.

NORTHERN MYTHOLOGY. The interesting discoveries made by a more intimate acquaintance with the mythologies of Hindustan and Egypt, and a comparison of them with that of Greece (discoveries which, in the opinion of some scholars, prove the existence of a universal original religion—a pure deism, as some think—and, at all events, show the eternal thirst of man to explain the origin of nature, of himself, and above all, of good and evil), justify us in assigning a separate place to the mythology of the North, which, even if its general traits were borrowed from Asia, must yet be considered as a distinct system. The northern mythology, in the systematic condition in which we now possess it, is the work of scalds, that is, of the ancient northern minstrels of Denmark, Norway, Sweden, and Iceland. Religion here, as is often the case, was intimately connected with poetry: and here also, as is so common, cosmogony was the basis of the religion—a cosmogony which at the same time proves the wild imagination of its authors, and the nature of the country where it originated. The following are its most important features:—There were originally no heavens above nor earth below, but only a bottomless deep (*Ginunga gap*) and a world of mist (*Niflheim*), in which flowed the fountain that strives to devour everything (*Hwergelmer*). Twelve rivers, called *Elivagar*, issue from this fountain. When they had flowed so far from their source that the liquid they contained had become hardened, they ceased flowing and froze into ice, and one layer accumulating over another, the great deep was filled up. Southwards from the world of mist was the world of light, or fire (*Muspelheim*, *Mispelheim*). From the former proceeded everything dark and cold; from the latter, whatever is warm and light; a warm wind blowing from the latter upon the ice (the rays of the sun from Muspelheim encountered the ice from Niflheim) melted it. The drops became living by the power of him who had sent the wind; and from them sprang Ymir, the ice-giant. Under Ymir's left arm grew a little man and woman, and one of his legs begot a son from the other. From them proceeded the ice-giants. From the mixture of ice and heat originated also the cow Audhumbla, from whose dugs ran four streams of milk, by which Ymir was fed. The cow supported herself by licking the salt blocks of the ice. As she was thus one day licking the blocks, lo, in the evening, human hair grew out of them; on the next day appeared a head, and on the third an entire man, called *Bure* (or *Buri*). His son was Bor, who married Belsta, daughter of the giant Mountain-gate. By her he had three sons, Odin, Vili (or Wile), and Ve, who became the rulers of heaven and earth. The children of Bor were good, those of Ymir wicked; and they were constantly at war with each other. The sons of Bor finally slew the ice-giant, dragged his body into the deep, and from it created the world. Out of his blood they made the sea and rivers; of his flesh, earth; of his hair, grass and trees; of his bones, rocks; and stones of his teeth and broken jaws; of his skull they made the heavens, which they extended over the earth by its four ends, at each of which they placed a dwarf, Austri, Westri, Sudri, Nordri. Of the sparks and light which had proceeded from Muspelheim they made stars and fastened them to the heavens, to give light to the earth. They threw Ymir's brain into the air, and it formed the clouds. Out of two ash-trees Odin, Vili, and Ve (or, according to others, Odin, Hoenir, and Lodr) created a man, called *Askur*, or *Ask* (ash), and a woman, *Embla* (alder). The first gave them life and soul; the second, motion and reason; the third, the face, language, hearing, and sight. A large ash (or an ash forest), called *Ygdrasil*, the tree of the world, stands over the well of time: its branches extend over the world, its top reaches above the heaven. It has three roots, one among the gods, another among the giants, and a third under Hela. Near the middle root is the fountain of wisdom, the fountain of Mimers. Near the heavenly root is the sacred fountain by which the gods hold their council and make known their decisions. From these fountains rise three beautiful maids, the Nornas, whose names are Urd (the Past), Varande (the Present), and Skuld (the Future). They determine the fate of mortals, and aid or punish them by their ministers. On the top of the ash sits an eagle, looking far around; a squirrel (Rotatoskr) runs up and down the tree; four stags (Dain, Dynair, Dnalin, and Dyrathor) roam through its branches, and eat the bark; a serpent gnaws its root below; the trunk of the tree rots; but the holy maids water it from the sacred fountain, that it may not wither. From the leaves of the ash falls a sweet dew, the food of bees. Over the fountain sing two swans. Here are heard Heimdal's song of the fate of the tree of the world; the voices of the past, the present, and the future in the council of the gods. The gods themselves seek to learn the wisdom of the Nornas, the stern goddesses who rule over all. On this account they were much honoured; temples were built in their honour, in which their oracles were consulted. The residence of the gods is Asgard, a fortress of heaven, whence the bridge Bifrost leads to the earth. Asgard contained the palaces of the gods; here was Valuskialf, the silver palace of Odin; in the centre, in the valley of Ida, was the place of meeting where the gods administered justice. This place was the most highly ornamented of all; in it was Gladsheim, the hall of joy; Vingolf, the palace of friendship and love; and Glasor, the forest of golden trees. The giants dwelt in Jötunheim or Utigard, and men in Midgard or Mannaheim.—This cosmogony is plainly a northern view of nature; we here see nature passing from the death of winter into life, and the beginning of the world connected with the appearance of spring. It was natural that, to the early Scandinavians, ice should have appeared as the primeval matter, and that it should be represented as evil, because it destroys the life of nature. The whole cosmogony is therefore a physical allegory, not inferior to those of other mythologies. The creation of day and night, the sun and moon, is thus related:—The giant Darkness (*Niörwi*, *Narfi*) had a daughter of the name of *Night* (*Nott*), dark and sombre like her race. She was thrice married, and bore to Nagelfari (Air, Ether) a son, Andur (Matter); to Anar (the forming principle) Jord (the earth); to Dellingar (Twilight) Dagur (Day), who was light, like his paternal race. Alfadur now took Nott and Dagur (Night and Day) to the heavens, and gave them each a horse and car to drive round the earth daily. Night rode first on her horse Hrimfaxi (Blackmane), which every morning bedews the earth with the foam from his mouth. The horse of Dagur, Skinfaxi (Shiningmane) illumines, with his mane, the air and earth. Mundilfari (Mover of the Axis) had two beautiful children, Sool and

Maan (Sun and Moon). Proud of the beauty of his daughter he married her to Glemur, the god of joy. The gods, offended at his presumption, took away his children, and transported them to the heavens. Sool was employed in driving the horses of the car of the sun, and Maan these of the car of the moon, and to watch over her increase and decrease.—So far the most ancient mythology, which creates giants (*jötun*) from the elements of nature. It can easily be perceived that with the death of Ymir a new period of mythology has commenced. The personifications, in the giants, of natural phenomena had to yield to an order of men. We only possess fragments of the oldest dynasty; but even here we can discern a threefold aspect of nature. The three elements—air, fire, and water—are represented in Kari, Hler, and Logi (called also Billegste, Halblinde, and Loki), in this respect resembling mythology generally, in which these three elements are deified. The greater number of the myths have their origin in the war between Aseir and Thursen, after which follows the destruction of Odin's rule, through the breaking forth of the hitherto fettered and confined power of the giants. Some deities, indeed, of the old dynasty become related in friendly compact to the later deities, such as the wise Mimi, the sea-god Oejir, and the goddess Gesion. The resemblance of the northern mythology to that of Greece, so far as regards the production of the gods by the giants and the overthrow of the old dynasty by a new race of gods, is particularly striking.

The ancient and modern systems seem to have their connecting-point in Odin, as with Zeus in the Greek system. We must doubtless distinguish an earlier and a later Odin. The former was the symbol and deity of light and the sun, and there are several interesting fables relating to him; as, for instance, of his marriage with the earth; his daily amour with the goddess of the waters, to whom he descends every night to drink of her element from the golden cup; of the marriage of his rays with the vapours of mother Earth, of which the fruit is the god of thunder, &c. All these fictions, however, were transferred to the younger Odin, the chief of the council of the Aser. The Aser are the new race of gods, which came in with the younger Odin, or descended from him. The Aser, that is, these new gods of the scalds, are as follows: Odin, or Woden (whence *Wednesday*), the god of gods, the first and oldest of all, who lives for ever; he sits upon the elevated throne Lidskjalf, whence he observes everything in the universe, alone, contemplating his own being. By his side stands the spear Gungnir. He has twelve chief names, and 114 others in the ancient Asgard. His swift steed is called *Sleipnir*. From him and his wife Frigga (or Frigg) are descended the gods, on which account he is called *Alfadur* (Father of All), or according to some, more correctly, *Walfader* (Father of All who fall in battle—a title which belongs to him as the ruler of Valhalla). Fra, wife of the king of gods, shares with him the wonderful throne, from which all countries are seen. She knows the fate of all mortals, but keeps it secret. Their sons are Thor, god of thunder—a symbol of physical strength, the strongest of gods and mortals, whose mighty step sounds like the storm, whose hammer, Miölnir (the Crusher), crushes the hardest objects—and Baldur or Baldr, the youthful and beautiful god of eloquence and just decision, the innocent who appears brilliant as the lily, and in honour of whom the whitest flower received the name *Baldrian*. His wife, Nanna, daughter of Gewar, looks with modest admiration on the mind of her husband. She bears Forfeti, the god of concord, who resembles the rainbow when it descends from the dark cloud. He puts an end to all strife. His palace, Glitner, rests on pillars of gold. Niord, who shakes his wings in the roaring storm, so that everything trembles, is the god of winds, of sailors, of commerce, and of riches. By his wife, Scada, a daughter of the mountain-giant Thiasse, he had the beautiful, beneficent, and mighty Frei and Freia. Frei, who floats in the shining garments of spring, is the ruler of the sun, and upon him depend rain and sunshine, plenty or dearth. He rules in Alfheim, where the elfs dwell. Instead of a horse he rides a boar with golden bristles. Gerda, Gymer's daughter, is his wife. Freia, Fraa, is the goddess of love. Her eye is an eternal spring; her neck and cheek light. The mildest and most bountiful of the gods, she is a friend of sweet song, and loves to hear the prayers of mortals. She mourns her lost husband, Odur, to whom she had born two daughters, Nossa, the model of all beauty and grace, and Gersemi. Tyr (or Ty), a son of Odin, the fearless god, who wounds by a look, is lofty as a fir, and brandishes the lightnings of battle. All brave warriors are under his protection, though he is not properly the god of war, but rather of power and valour, and no friend of peaceful agreement. Of a different character is his brother Braga, the god of wisdom and poetry, which, from him, is called *Bragur*. He appears with a golden *telyn*, and strikes the chords, which emit a sweet sound. His wife is Iduna (or Idun), who preserves the apples of immortality, which she offers in vessels of gold to the heroes at their entrance into Valhalla—those apples which alone preserve the eternal youth of the gods. Other sons of Odin are—Hermode, the messenger of the gods, armed with a helmet and mail; Vidar, strong as Thor, the god of silence; and Wale (or Vali), the god of the bow. Ullr, son of Thor the Thunderer, is of a beautiful figure, master of archery and skating, who was invoked by those who engaged in single combat. A silver circle surrounds the down of his chin. His empire is Ydalir (that is, Rain-valleys).

The following gods are of a most mysterious character:—Hoder (Hödr), the blind god, murderer of Baldur, whose violent deed the gods never forget, but whose name they must never hear pronounced; Heimdal (Himindal), a son of nine gigantic sisters, born on the margin of the earth, a great mysterious god who guards the Bifrost, the bridge to heaven (rainbow), against the giants. He sees as plainly by night as by day; his ear hears the grass grow in the field, and the wool on the lambs. He is represented with a pensive brow, his eye fixed upon his calm breast.

Among the goddesses we must mention Laga, the first next to Frigga; Syra, the physician of the gods; Gesion, goddess of chastity, who, herself a virgin, protects all chaste virgins, and, if they die unmarried, takes them to her heavenly dwellings; Jylla, a virgin like Gesion, with beautiful locks, and a diadem of gold, is intrusted with the secrets of Frigga, whose messenger, Gna, floats about with the rays of the sun; Hirn (Lyna), the Gentle, who kisses away the tear from the eye of the unfortunate, the goddess of friendship and good faith, who is united with several servants of the goddess of love; Siona (Siöfn), who awakens the first sweet feelings in the breasts of youths and maids, and disposes them to mutual love; Lobna (Lofn), endowed with the power to reconcile divided lovers; Wara, the goddess of marriage, who hears the secret vows and oaths of lovers, punishes the faithless, and unites the true; Snotra, the goddess of modesty, is the protectress of virtuous youths and maids; Wora, the all-knowing, penetrates every secret of the heart; Synia (Syn), the guard of heaven, is the goddess of justice and law, and exposes perjury.

The Valkyrias, or Disas, are awful and beautiful beings, neither daughters of heaven nor of hell;

neither begot by gods nor cradled in the lap of immortal mothers. Nothing is said of their origin. Their name signifies the 'choosers of the slain' (from *val*, a heap of killed, and *kyria*, to choose). They appear awful and horrid in the songs of the scalds; yet we find them to be the beautiful maids of Odin, with helmet and mail, and mounted on swift horses. Heroes long for their arrival, enamoured of their charms. They conducted the heroes to Valhalla, a beautiful palace reserved for heroes who had fallen in battle.

The number of heroes is immense, and will increase indefinitely; yet the gods will wish that it were still greater when the wolf Fenris comes. This leads us to throw a glance at the wicked Loki. Loki, the son of the giant Farbaute and of Laufeya, is, if not a god, yet a superhuman being, beautiful of body, but malignant of spirit. By the giantess Angerbode (Messenger of Evil) he had Hela, the goddess of the lower regions, half blue and half flesh colour, and with a terrible figure, the wolf Fenris, and the terrible serpent of Midgard, Jormungandur, which surrounds the whole earth. Hela rules in Niflheim. Her hall is called Elidnir (Grief); her bed Kor (Disease); her table Hungr (Hunger); her servants are Ganglati and Ganghol (Lethargy and Delay). All who died of sickness and old age descended to her dark mansion. Thus Niflheim and Asgard are opposed to each other as existence and non-existence, and the scalds imagined that destruction would finally be victorious over everything that is: hence their idea of the end of the world. Three terrible winters, and again three more, will succeed each other; snow will rush in from all sides, the cold will be severe, the storms violent, the sun covered, and bloody wars will distract the whole world. This is the sign that the destruction of the world, and the great 'twilight of the gods' (thus the end of the world is called) is nigh. The wolf Fenris—a monster which, when it opens its jaws, touches the skies with the upper, and with the lower the primeval abyss—devours the world, while the inhabitants of Muspelheim, under the command of Surtur, make an attack upon Asgard. Heaven is stormed by these giants, and heaven's bridge falls when they ride over it. For this reason Heimdall is placed there as a watch, and the gods look with pleasure upon the numerous combatants of Valhalla. But all precaution is vain: the gods must perish, even the all-powerful Odin and the mighty Thor. A new sun will then illumine the earth, and Lift (Lif) and Liftrasor (Lifthrasir)—a human pair saved from the destruction, and nourished on morning dew—will renew the human race. There will be new dwellings for the just and unjust, for reward and punishment—Gimle (a splendid residence towards the southern end of heaven) and Nastrand. Widar (the Conqueror) and Wale (the Powerful) will live in the dwellings of the gods, after the flame of Surtur is quenched. Mode (Mental Power) and Magne (Strength) will receive the crushing hammer, after Thor, exhausted by the struggle, has perished, and Widar tears the jaws of the wolf asunder.

These myths have been preserved in the Edda and the Sagas. The mythology of the ancient Germans was essentially the same as the northern mythology. See Grimm's Deutsche Mythologie, Simrock's Handbuch der deutschen Mythologie mit Einschluss der nordischen, Petersen's Nordisk Mythologi (Copen. 1849 and 1865), Dasent's Tales from the Norse, Thorpe's Northern Mythology; also the article MYTHOLOGY.

NORTHMEN, or NORMANS, the inhabitants of the ancient Scandinavia, or Norway, Sweden, and Denmark. This name was given to them in the Netherlands, in Germany, and France; in Britain they were called *Danes*. They were fierce and warlike tribes, who made piratical expeditions to all parts of the European seas, plundering by land and by sea, and often overrunning large tracts of country, in which they practised every enormity. 'They had scarcely any inducement,' says Mackintosh (Hist. of Eng.), 'to spare countries which they visited only to plunder, and where they did not hope to dwell; they were less than others liable to retaliation, and they had neither kindred, nor family, nor home. They were, perhaps, the only barbarians who applied their highest title of magistracy to denote the leaders of piratical squadrons, whom they termed *vikingr* or *sea-kings*. Not contented with their native and habitual ferocity, some of them (called *Berserker*) sought to surpass their companions by working themselves into horrible and temporary insanity.' *Vikingr* does not, however, mean sea-kings, but is derived from *vik*, a bay or creek. The poverty of their country compelled them to adopt this means of subsistence, and their religion inspired them with a love for daring enterprises, since it taught them that warriors, fallen in battle, were admitted to the joys of Valhalla, the northern paradise. (See NORTHERN MYTHOLOGY.) In 795 some Norwegians established themselves in the Faröe Isles and in Orkney; towards the middle of the ninth century they founded the governments of Novgorod and of Kiev, in Russia; and after the discovery of Iceland certain powerful Norwegian families, taking refuge from the persecutions of Harold, king of Denmark, settled in that island. The Northmen began their piratical excursions in the first part of the ninth century, and soon covered the sea with their boats, and ravaged the coasts of England, Germany, Friesland, Flanders, and France. Under the feeble reigns of Charles the Bald and Charles the Fat they ascended the rivers to the very heart of France, and plundered Paris itself. It became necessary to purchase their retreat with gold. Their incursions into France were afterwards renewed, and Charles the Simple was obliged (912) to cede to them a part of Neustria (which see), which was afterwards called, from them, *Normandy*, and to give his daughter in marriage to Rollo, their chief. Rollo embraced the Christian religion, was baptized under the name of Robert, and became the first Duke of Normandy, and a vassal of the King of France. His followers received the religion of their leader, and abandoned their roving and piratical habits; though they still retained, as also did their descendants for a long time, marks of their Scandinavian origin, and that warlike ardour which had rendered them so terrible to those against whom they directed their attacks. Long after their settlement in France the Catholic litany still retained the words, 'A furore Normannorum libera nos, Domine.' Britain was, for about two centuries, desolated by the Danes, as the Northmen were there called. Egbert (see EGBERT), in the beginning of the ninth century, had no sooner made some approaches towards a regular government, and the establishment of tranquillity, than the 'Scandinavian heathens,' as the Saxons termed them, made their appearance. Alfred (871–901) finally delivered the country from the invaders, after they had subdued the whole land except the 'isle of the nobles,' into which the king had retreated with a few nobles. But the relief was only temporary: they returned, under his successors, in greater force, obtained possession of the northern and eastern part of the country, and in the beginning of the eleventh century three Scandinavian princes (Canute, Harold, and Hardicanute) ruled over all England for the space of about twenty-five years. The Saxon line was then restored; but in 1066 William, duke of Normandy, obtained the English throne. This conquest, as it is commonly called, had a most important

influence on the Saxon manners, language, and constitution, which had hitherto escaped with little change, and is therefore one of the most important epochs in English history. In the year 1000, according to the Saga narratives, Leif, son of Eric the Red, leaving Greenland, which had been discovered and settled by his father, a Norwegian, proceeded southwards in a ship, accompanied by thirty-five men, and discovered the American coast, to which he gave the name of Vinland. In 1007 a rich Greenlander, with a following of sixty, emigrated to Vinland, and there planted a colony, which seems to have thriven, but after a time we hear nothing more about it. The Normans also established a new kingdom in Naples in 1016. (See NAPLES.) The foreign expeditions of the Northmen gradually diminished their numbers and strength at home, and rendered them less formidable. See Depping's Histoire des Expéditions maritimes des Normands et de leurs Établissements en France au 10me Siècle (Paris, 1826); Worsaae's Account of the Danes and Northmen (London, 1852), and his Ten danske Erobring af England og Normandiet (Copenhagen, 1863); and Freeman's History of the Norman Conquest of England (London, 1867).

NORTH POLAR EXPEDITIONS. Arctic exploration has for several centuries back been a favourite project with adventurous navigators. In 795 Iceland, then uninhabited, was visited by some Irish monks from the Faröe Isles. The island was rediscovered in 867 by the Viking Nadd-Odd, and a few years later was settled by the Northmen. About the year 870 the Norwegian nobleman Ottar proceeded on a voyage of discovery along the Scandinavian coast towards the North, rounded the North Cape, and sailed through the White Sea as far as the Dwina. About this time also Hunnbjörn saw the east coast of Greenland, which was again discovered by Eric the Red of Iceland, who settled there. In the year 1000 Bjarne, whilst on a voyage to Greenland, was driven southward, and came upon a well-wooded coast, which is likely to have been either that of Newfoundland or of Nova Scotia, and accordingly he may be regarded as the first known discoverer of America. Leif, a son of Eric, discovered Labrador in the year following. The extension of geographical knowledge thus brought about by the Northmen remained, however, unknown to the greater part of the world. In 1553 the North Cape was a second time discovered—this time by the English. In 1517 Sebastian Cabot, who had already been upon the coast of Labrador in 1497 and 1498, discovered Hudson Strait. Cabot had been commissioned by Henry VIII. to search for a north-west passage to India; and from that time onwards the discovery of such a passage became a favourite project with navigators. Frobisher in 1577 sailed into one of the many entrances to Hudson's Bay. In 1587 Davis discovered the strait which bears his name. Hudson discovered in 1610 the straits and bay called after him. In 1616 Bylot and Baffin examined the eastern parts of the great channel called Baffin's Bay, and discovered Lancaster and Smith Sounds. The first period of polar exploration may be said to have ended in 1631; the next period did not commence till the year 1818, when John Ross and Parry made voyages to the Arctic regions. Captain Ross was directed more especially to examine the western coast of Baffin's Bay, and the chief geographical result of his voyage was the more accurate determination of the extent and situation of that bay. Lieutenant Parry, who had accompanied Ross on this expedition, was despatched by the British government in 1819 for a further exploration of Baffin's Bay. He penetrated through Lancaster Sound into Barrow's Strait, and wintered in the harbour of an uninhabited island, to which he gave the name of Melville Island. He discovered other islands to the north of this, which he called the North Georgian Islands. He then proceeded westward until his course was stopped by immense fields of ice in 113° 46′ W. lon. and 74° 28′ N. lat., when he was compelled to return. In 1825 Parry, accompanied by Captain Lyon, made another voyage, proceeding through Lancaster Sound into Prince Regent Inlet, but without adding, in any appreciable degree, to his previous discoveries. This inlet was again made the subject of investigation by John Ross in a second expedition undertaken by him in 1829–33. The chief result of this protracted expedition was the discovery of Boothia-Felix, so named from Mr. Booth, who had been at the expense of fitting out the expedition. The true position of the magnetic pole was found to be on the western shore of Boothia, and much important information was obtained. In 1845 the British government despatched Sir John Franklin, in command of the *Erebus* and *Terror*, to make another attempt for the discovery of a north-west passage. Franklin set sail in May, 1845, and by the month of July reached Whalefish Islands in Davis' Strait. On the 26th of that month the ships were seen in lat. 74° 48′ N.; lon. 66° 13′ W.; after which no further intelligence concerning them was received. It was not, however, till the beginning of 1847 that serious apprehensions began to be entertained regarding the fate of the expedition. The most strenuous efforts were then made on the part both of the English and of the Americans to obtain tidings of Franklin. Richardson and Rae proceeded in 1847 overland to the north of America, and searched along the coast from the Mackenzie to the Coppermine Rivers. Moore (1848–52), Kellet (1848–50), and Shedden (1848–50) were despatched to Behring's Straits to make search for the missing vessels in that region; but these were unsuccessful. Equally unsuccessful were the voyages of Sir James Ross to Lancaster Sound (1848–49); of Saunders to Wolstenholme Sound and Pond's Bay (1849–50); of De Haven (1850–51); of Goodsir to Baffin's Bay (1849); of Austin and Ommaney to Lancaster Sound and Cornwallis Island (1850–51); of Penny to Lancaster Sound and Wellington Canal (1850–51); and of Forsyth in 1850 to Regent's Inlet. In 1850 M'Clure set out by Behring's Straits on another search expedition. He likewise was unsuccessful in the immediate object of his quest; but to him, in the course of this expedition, is due the honour of having ascertained the existence of the long-sought-for north-west passage. Other expeditions followed: Collinson (1850–55) proceeded to Behring's Straits, Bank's Island, and Wollaston Island; Rae, in 1851, went up from the Coppermine River to Wollaston Land and Victoria Land; Kennedy sailed (1851–52) to Prince Regent's Inlet, Bellot's Straits, and Prince of Wales Island; Maguire (1852–55) to Behring's Straits; Belcher (1852–54), with Kellet, Osborn, M'Clintock, Pullen, and Mecham to Parry Island; and Inglefield in 1853 and 1854 to Beechey Island. In 1853 Rae again visited Wollaston Land and Victoria Straits, and afterwards proceeded to the east side of King William Sound, where he obtained the first tidings of the destruction of Franklin's ships. In 1855 Anderson, proceeding up the Great Fish River to Montreal Island and Point Ogle, also discovered relics of the *Erebus* and *Terror*. At length M'Clintock (1857–59) set all doubts at rest regarding the fate of Sir John Franklin and his companions by establishing the fact that they had died in 1847. Dr. Kane made some important observations during the progress of his Arctic explorations, 1853–55. In 1860 Dr. Isaac Hayes organized another expedition to obtain if possible a confirmation of his

belief in the existence of an open Polar Sea. He penetrated as far north as 82° 45′. He made another visit to Greenland in 1869, and explored the southern coasts of that peninsula. Capt. Charles Hall also made several expeditions to the Arctic Regions; one in 1860, in which he learned a number of particulars concerning the death of Franklin; and again in 1864, remaining in the north for five years.

Simultaneously with the attempts made to discover a north-west passage, efforts were also made to discover a north-east passage to the Great Ocean. In 1553 Willoughby rounded North Cape; in 1556 Burrough reached the south point of Nova Zembla and Waigatsch Island; in 1580 Pet and Jackman penetrated into the Sea of Kara; in 1594–96 Barents discovered Bear Island and Spitzbergen, and rounded the east point of Nova Zembla. The discovery of Spitzbergen, and of an open sea in such a high latitude, awakened the hope of finding the desired passage; but Hudson's visits to that region in 1607–8 were without any result. Various expeditions were undertaken by the Russians to explore the northern shores of Asia by land. The mouths of the Yenisei were reached in 1610, those of the Lena in 1637, and those of the Kolima in 1646. The Cosack, Ivan Moskvitin, penetrated in 1639 to the Sea of Ochotsk; Deshnef in 1648 discovered Behring's Straits. The knowledge, however, of this important discovery was not widely diffused, and in 1728 Behring's Straits was discovered a second time by Behring, whose name it bears. Under the direction of this celebrated Russian navigator there began in 1734 a new series of explorations, with a view to the more accurate examination of the North Asiatic coasts. In the course of one of these expeditions Maluigin and Skuratof sailed from Archangel to the Obe, and in the same year Owzyn proceeded from the mouth of the Obe to that of the Yenisei. Prontchistchef, Laptef, and Tcheljuskin examined, from 1735 to 1743, the coast line between the Lena and the Yenisei, including the Taimyr Peninsula, which was again visited by Middendorff in 1843. In 1730 Gvosdef made an exploring voyage along the American coast of Behring's Straits. A more correct idea of the configuration of the coast on either side of Behring's Sea was first obtained by Cook in 1778; but with the exception of this, to the Russians is due nearly all the credit, until recently, of the explorations on the North Asiatic coasts. Loshkin in 1760–63 accomplished the complete circumnavigation of Nova Zembla, which also was the aim of the four voyages of Lütke (1821–24), and the east coast of which was examined by Pachtusof, Zivolka, and Moisejef (1834–39). Lächow in 1770–73 discovered the New Siberia Islands, which were again examined in 1809–11 by Hedenström, and which in 1823 were made by Anjou the starting-point of a sledge journey over the frozen sea, to a point as high as 76° 35′ N. lat. The north-east passage was at last discovered by Prof. Nordenskiöld of Stockholm, who in 1878 sailed eastward along the whole of the north coast of Europe and Asia to about 173° W., was beset and detained there by ice from the end of September, 1878, till April, 1879, and soon after the latter date sailed through Behring's Strait.

With regard to the northern portion of the American continent, it was first explored by Hearne in 1771, from Fort Churchhill to the Coppermine River, and on to the Polar Sea. In 1789 Mackenzie discovered the river called after him, and traced it down to its mouth. The north coast between these two rivers, and eastwards to the Great Fish River, as well as westwards to Cape Barrow, was explored by Franklin, Richardson, and Back in two expeditions by land, the first continuing from 1819 to 1821, and the second from 1825 to 1826, and by Dease and Simpson from 1837 to 1839, while Back in company with King proceeded down the Great Fish River.

With regard to explorations on the coast of Greenland, besides those conducted by Kane and Hayes already alluded to, expeditions had been previously undertaken by Clavering in 1823, and Graah in 1829 to 1831, and in 1834. The most important explorations in Greenland itself were made by Rink from 1848 to 1856. The principal expeditions in more recent times to Spitzbergen were those of Clavering and Sabine in 1823; of Parry in 1827, who reached, on the 23d July, in sledges, lat. 82° 45′; the French expedition in the *Recherche*, in 1835. Still more recently the Swedes have been very active in exploring this region.

The Germans sent out their first expedition to the Polar regions in 1868 under Captain Koldewey, and a second in 1869 under the same captain; but as far as geographical discovery is concerned they did not effect much, but the staff of scientific men belonging to the latter expedition succeeded in amassing a large amount of material in all branches of science. An Austrian expedition under the conduct of Lieutenants Payer and Weyprecht was despatched in June, 1872, with the object of rounding the north-eastern end of Nova Zembla, and pressing to the eastward, through the Polar Sea, to the north of Siberia. They returned in November, 1874, having discovered Franz-Joseph Land, previously unknown, to the north of Nova Zembla. They explored the coast in sledges as high as 82° 30′, and observed land as high as 83°. A Swedish expedition under the guidance of Nordenskiöld started from Tromsö in July, 1872, and returned in 1873, having been unable to advance beyond the Seven Islands. In 1875 Britain sent out an expedition under Captain (afterwards Sir George) Nares, and composed of two steamships, the *Alert* and *Discovery*. Proceeding up Smith's Sound, the two ships went into winter quarters in high latitudes, those of the *Alert* being in 82° 27′ N. The expedition returned in October, 1876, after making many important observations and investigations. One of its sledge-parties reached the highest lat. ever attained, 83° 20′ N.

In 1879 the steamer *Jeannette* was fitted out by Mr. Bennett of the New York Herald, and placed under the command of Lieutenant De Long to explore the Arctic Sea through Behring's Straits. After drifting for twenty-two months in the pack ice of the Arctic Ocean, the steamer was crushed by the ice (23d June, 1881) in lat. 77° and E. lon. 157°. In an attempt to return by land De Long and about half his crew perished by hunger and exposure; the other members of the party, taking a different route, returned in safety. In 1880 Mr. Lee Smith in the *Eira*, a steam yacht fitted out by himself, explored a great part of the coast of Franz-Joseph Land, the ship reaching its highest position in lat. 80° 19′. In 1881 Mr. Smith made a second voyage, but his vessel was nipped by the ice and sank near Cape Flora, 21st Aug. After passing a dreary winter, living on bear and walrus meat, the explorers succeeded in reaching Nova Zembla, where they fell in with the steamer *Hope*, commanded by Sir A. Young, which had been sent to their relief. The expeditions sent out in 1882 can scarcely be said to have been fortunate. Sir H. Gore-Booth in the *Kara*, and the Dutch exploring vessel *Willem Barentz* both failed to make their way into the Kara Sea. At an international conference held at St. Petersburg in August, 1881, a project of establishing stations for scientific observations within the North Polar circle was adopted. According to this arrangement it was

determined that these several stations should be settled and maintained at the expense of the various countries who supported the proposal. The principal stations are Möller Bay, Nova Zembla, and Sagastyx Island at the mouth of the Lena, both occupied by Russia; Dicksonshavn, at the mouth of the Yenesei (Holland); Ja Fiord in Spitzbergen (Sweden); Jan Meyen (Austria); Fort Rae, on the Slave Lake (England); Godshaab on the west of Greenland (Denmark); Cumberland Sound (Germany); Fort Conger, in Lady Franklin Bay, and Point Barrow (United States). Most of those stations have been occupied, and the observers, after a year or two's residence, have returned with valuable reports. The Dutch expedition in the *Varna*, and the Danish in the *Dijmphna* were compelled to return without having reached their stations. The United States' Expedition to Fort Conger under Lieutenant Greely has, owing to severe weather, been cut off from communication with the rest of the world, the *Proteus* being wrecked in an attempt to relieve them (13th July, 1883), and it is feared that the party must have succumbed.

NORTH POLE. See POLE.

NORTH SEA, or GERMAN OCEAN, a large branch of the Atlantic Ocean lying between Great Britain and the continent of Europe, having the former and Orkney and Shetland Islands on the west; Denmark and part of Norway on the east; Strait of Dover, part of France, Belgium, Holland, and Hanover on the south; and the Northern Ocean on the north; lat. 51° to 61° N.; lon. 2° 30′ W. to 7° 30′ E. Extreme length, from the Strait of Dover to Unst, the most northern of the Shetland Isles, about 700 miles; greatest breadth, between Haddingtonshire, Scotland, and of Denmark, about 420 miles; area not less than 140,000 square miles. The shores of all the countries that surround the North Sea are deeply indented with bays, fiords, inlets, and large estuaries; but its most remarkable arm is the Skager Rack, between Denmark and Norway, which communicates through the Kattegat with the Baltic Sea. The North Sea is deepest on the Norwegian side, where the soundings give 190 fathoms; but the mean depth of the whole basin may be stated at no more than 31 fathoms. The bed of this sea is traversed by several enormous banks, one of which trends from the Firth of Forth, Scotland, in a north-easterly direction, to a distance of 110 miles; others run from Denmark and Jutland upwards of 105 miles to the north-west; while the greatest of all, the Dogger Bank, occupies the centre of the sea, from lat. 54° 10′ to 57° 24′ N., and lon. 1° to 6° 7′ E. The great oceanic tidal wave, which originates in the Atlantic, after having swept the west coasts of Great Britain and Ireland, enters the northern extremity of the North Sea, giving high water nearly simultaneously to the opposite shores of Scotland and Norway. Pursuing its course along the coasts of the former and of England, on which it strikes very directly and with great force, it rules the tides as far south as the Thames, making the tour of Great Britain in eighteen hours. It determines also the tides of Belgium from Ostend to Dunkirk. On entering the North Sea, on the north of Scotland, the tidal wave does not exceed 12 feet; but gradually increases to 14, 16, 18, and on the Humber to 20 feet; a difference of height depending on the figure of the shore, the form of the bottom, and the direction of incidence of the wave. The fisheries in this sea are extensive, as well on the Dogger Bank, celebrated for its cod-fishery, as on all the shores that bound it; they are still greater at its northern extremity, in the direction of the Orkney and Shetland Isles.

NORTHUMBERLAND, a northern maritime county of England, bounded south and south-west by the counties of Durham and Cumberland; east by the North Sea, and north and north-west by Scotland. Area, 1,290,312 acres, of which about 712,600 acres are arable, meadow, and pasture. In some places it is rugged and mountainous, and in others, particularly along the coast, it is level. The highest hills are on the north-west border, towards Scotland, commonly called the Cheviot Hills; clothed with a beautiful green verdure, admirably suited for pasture lands, as which they are extensively used for feeding the well-known excellent breed of sheep to which they give their name. The other hills are mostly covered with turf, and produce little except heath, which is the case also with some extensive and dreary moors and morasses. It is watered by the Tyne, Wansbeck, Blyth, Coquet, Aln, and Till. Coal-measures occupy an area of 180 square miles, and lead, iron, limestone, and freestone are wrought; and basalt is met with in various localities. The soil in the southern part of the county, or between Newcastle and Morpeth, is generally a strong clay; north and west it is a poor, infertile clay; along the coast it consists of strong wheat land, more or less fertile, but generally of superior quality. Arable and stock husbandry are both prosecuted with great spirit and success, and the short-horned cattle, mostly reared, are much prized. In 1883 there were 93,550 cattle and 880,230 sheep in the county. The principal corn crops are wheat and oats, the latter of excellent quality; a good deal of barley also is grown. Corn crops occupied 126,439 acres in 1883, green crops 55,199, clover and grasses under rotation 84,562. The staple manufactures are principally derived from, or connected with the coal trade and mines; they include ship-building and rope-making; forges, foundries, iron, hardware, and machine works, copperas-works, soda or marine alkali manufactories, white-lead works, potteries, glass-works, &c. Newcastle is the chief manufacturing centre. The trade is greatly facilitated by the numerous harbours on the coast, and by the railways which connect Newcastle with Carlisle, Berwick, Shields, and the counties of Durham, York, &c. The coast abounds in fish, cod, ling, haddock, soles, turbot, herrings, and a variety of others; cockles and oysters, the latter of excellent quality, are also plentiful. Northumberland (exclusive of Berwick) returns eight members to Parliament; four for the county, two for the borough of Newcastle, and one each for Morpeth and Tynemouth, with North Shields. Principal towns, Newcastle, Tynemouth, North Shields, Morpeth and Alnwick. Pop. (1871), 386,646; (1881), 434,086.

NORTHUMBRIA, one of the seven Saxon kingdoms of Britain, which extended from the Humber to the Forth, and was bounded on the west by the Kingdoms of Strath Clyde and Cumbria. The kingdom was founded by Ida, an Anglian chief, who invaded the country in 547. At first it extended only from the Tyne to the Forth, and was known by the name of Bryneich or Bernicia; and on the death of Ida in 560 part of it was incorporated in the Kingdom of Deifyr or Deira, which occupied besides what is now the county of York. Bernicia and Deira were united under Ethelfrith in 593. In 792 it was ravaged by the Danes, and again in 844 and 867. They succeeded in completely conquering the inhabitants, and permanently settled in the country. Halfdane became sovereign, and portioned out the land among his followers. In the treaty which Alfred made with the invaders Northumbria was included in the Danelagh. Against Alfred's successors the Danes carried on a series of petty wars, till the dissolution of the Kingdom of Northumbria in 950. It was then divided into the three earldoms or counties of Bernicia, Deira, and Lothian.

NORTH WALSHAM, a market town of England, in the county of Norfolk, 14 miles N.N.E. from Norwich, on a gentle eminence between the rivers Ant and Bure. Among the public buildings may be mentioned the church, recently restored, a fine specimen of the perpendicular style; several dissenting chapels; the corn exchange, a free grammar school, a National and board school, &c. Its market-cross, repaired after the fire in 1600, which nearly destroyed the whole town, dates from the reign of Edward III. On the Ant are several mills, and in the town agricultural implement works. Pop. (1881), 3234.

NORTH-WEST PASSAGE. See NORTH POLAR EXPEDITIONS.

NORTH-WEST PROVINCES, a political division of British India, which forms a great semicircular tract surrounding the province of Oudh on the west, south, and east, and lying between the Panjab, the Central India Agency, and the Lower Provinces. It consists of the following seven divisions: Mirat, Kamaun, Rohilkhand, Agra, Jhansi, Allahabad, and Benares. Each of these is under a commissioner. There are besides two natives states, Garhwal and Rampur. The total area is 74,547 square miles, of which about 42,000 were under cultivation according to recent returns. This portion of India is very mountainous in the north (in Garhwal and Kamaun). It is well watered by the Ganges and its tributaries, being bounded or traversed throughout by this river, besides which there is an extensive system of irrigation canals. The population in 1881 amounted to 32,415,615. In 1877 Oudh was amalgamated with the North-west Provinces, which will bring up their area to 111,229 square miles, and the pop. to 44,849,619.

NORTH-WEST TERRITORIES, a large section of the Dominion of Canada, including all that portion of British North America north of the St. Lawrence and the United States, and outside the provinces of Ontario, Quebec, Manitoba, and British Columbia. It has on the north the Arctic Ocean, on the east the Atlantic, on the west British Columbia and Alaska territory, and on the south parts of the Dominion of Canada and the United States; estimated area, 2,665,000 square miles. This immense district (excluding Labrador) was known as the Hudson's Bay Territory up till 1870, when the Hudson's Bay Fur Company surrendered it to Canada for the sum of £300,000. The territories are governed by a lieutenant-governor and a council of five members. Regina is the seat of government. In 1882 the territories were partly divided into four provinces, Assineboia (95,000 sq. m.), Saskatchewan (114,000 sq. m.), Alberta (100,000 sq. m.), and Athabasca (122,000 sq. m.). The agricultural capabilities of at least a third of this region are very great. The fertile belt of the Saskatchewan alone contains an area of 64,000 in one continuous strip of 800 miles long, with an average breadth of 80 miles. But the best and largest wheat area is said to be beyond the Saskatchewan, namely, in the valleys of the Athabasca and Peace Rivers, and extending through the Peace River Pass to the western slope of the Rocky Mountains, and north to lat. 60° N. The lakes and rivers west of Lake Superior are bordered by rich prairies and luxuriant woods, and vast herds of elks and buffaloes roam on the plains. About 150 miles east of the Rocky Mountains is a great coal-bed over 300 miles in width, and extending continuously over 16° of latitude to the Arctic Ocean. Iron, salt, and gold have been found in various localities. Since 1670 the Hudson's Bay Company have used this territory as hunting grounds from which to obtain supplies of furs for all markets in the world. The other articles of commerce are oils, dried and salted fish, feathers, quills, and walrus ivory. The Canadian Pacific Railway, when completed, will run through the Saskatchewan valley. Pop. (1881), 56,446, of whom about 25,000 are Indians.

NORTHWICH, an ancient market town in England, in Cheshire, and 15 miles north-east of Chester. Near it are numerous brine-springs and extensive mines of rock-salt, which give employment to a great number of hands, their produce forming the commercial staple of the place. About 1,000,000 tons of salt are said to be exported annually. Many of the boats employed in conveying the salt to Liverpool are built here. Pop. (urban sanitary district), 12,246.

NORTON, THE HON. CAROLINE E. S., an English authoress, grand-daughter of R. Brinsley Sheridan; born in 1808; died June 15, 1877. In her youth she was a celebrated beauty, and in 1829 she married the Hon. George C. Norton, brother and heir-presumptive of Lord Grantley; but the marriage did not prove a happy one, and from 1836 she lived separate from her husband. Shortly after the death of the latter in 1875, she married Sir W. Stirling-Maxwell. Her works are chiefly poems and novels. Her poems, among which the chief are the Undying One, Dream, and the Child of the Islands, besides a number of lyrics, nearly all belong to the earlier part of her literary career, Her best novels are Stuart of Dunleath and Old Sir Douglas.

NORWAY (Norwegian, *Norge;* Swedish, *Norrige* or *Norrike*, North Kingdom), a country, in the north of Europe, and now forming the western portion of the Swedish Monarchy; lat. 51° to 71° 11′ 40″ N.; lon. 3° 50′ to 30° 50′ E.; bounded on the north-east by Russian Lapland, and east by Sweden, and washed on all other sides by the sea—by the Arctic Ocean on the north, the Atlantic and the North Sea on the north-west and west, and the Skager-Rack on the south. It is very irregular in shape; taking the Naze or Cape Lindesnaes on the south, and a point adjoining the North Cape as the opposite extremities, the length, S.S.W. to N.N.E., is about 1080 miles; greatest breadth, measured nearly in the parallel of 60°, is about 275 miles, but towards the north it narrows so much as to be in some places not more than 20 miles; area, 122,280 square miles. For administrative purposes it is divided into six stifts or dioceses, subdivided into twenty bailiwicks. These stifts, with their respective populations in 1875, are —Christiania, 489,915; Hamar, 236,432; Christiansand, 342,672; Bergen, 284,061; Trondhjem, 271,575; Tromsoe, 182,245: total population, 1,806,900, or about 15 to the square mile.

The coast consists for the most part of bold precipitous cliffs, and is remarkable both for the innumerable islands by which it is lined, and the bays or fiords which cut deeply into it in all directions, but far most frequently from west to east, in the direction in which the great ocean-wave is dashed upon it. The number of islands makes the navigation dangerous, but that of the fiords gives it unusual facilities, not only making it easy to penetrate into the interior, but also furnishing an almost uninterrupted series of excellent natural harbours of refuge.

The surface is very mountainous, particularly in the west and north, where the summits are often lofty, and rise very abruptly from the surrounding levels; but even their mountain chains, properly so called, have no existence, and the true character of the surface is that of a series of elevated plateaux, from which mountain masses rise with the greatest irregularity, and so isolated from each other that it is impossible to point out any central axes of which the other mountains in their vicinity can be considered as ramifications. The plateaux referred to seem to admit of being reduced to six:—1. The plateau of

Finmark. Its most elevated summits are situated in the vicinity of the Lake of Torneå-Troesk, near the Gulfs of Lyngen and Quevenangen. 2. The plateau of Nordland and Trondhjem, extending to the Gulf of Trondhjem and Lake Storsjön. Its loftiest summits are in the vicinity of the icy Mountain of Sulitelma, the top of which is 6342 feet high. Though not one of the loftiest, yet one of the most remarkable-looking mountains in this plateau is that of Kilhorn, shooting up in a pyramidal form, with a bare, jagged, and sharp peak; at about three-fourths of its height occurs a large perforation, producing a very extraordinary effect when the sun is seen streaming through it. 3. The Dovre Field Plateau, with its lofty peaks of Sneehæten (8115 feet), Skrimkolla, Stenkolla, and Nunsfield, the lowest of which is nearly 7000 feet. 4. The Plateau of Langfield, from which the loftiest summits of Norway rise, and transcend the limits of perpetual snow. Among these summits are the Skagastölstind (8390 feet), generally considered the loftiest in the country, but, according to De La Roquette, exceeded by the Galdhöppigen, in the parish of Lom, Gudbrandsdal, to which he assigns the height of 8785 feet. 5. The Plateau of Fillefield, situated between the Sogne Fiord, the valley of Valdre, the fiords of Rand Tyri and Christiania, the Skager-Rack, and the German Ocean. This plateau is much less elevated than the others already mentioned, the whole country gradually sloping from the north, where it is highest, towards the east and south-east, and ultimately subsiding so much as often to assume the appearance of moderately-elevated plains. Its loftiest summits—the Skogshorn, Hogloftsteg, and Gousta—are all about 6000 feet, and several others exceed 5000 feet, but the average height is very much lower. 6. The eastern plateau, lying still more in the direction of the general slope, is the lowest of all, and is continued into Sweden. In general the valleys are short and abrupt; and the streams, dashing down impetuously through rocky gorges, form numerous cascades; while the fiords, overhung by lofty precipices or towering forests, and the deep and extensive lakes embosomed among the mountains, furnish Alpine scenes of the wildest magnificence.

The short distance at which the western slope of the above plateau lies from the western coast gives rise to an immense number of minor streams, which proceed directly to the shore or the fiords which penetrate it. On the eastern slope again the streams do not properly assume the character of rivers till they have run a considerable part of their course in Sweden. The few important rivers that Norway can claim as exclusively her own have a southerly direction in accordance with the general slope already referred to, and discharge themselves into the Skager-Rack; of these the most deserving of notice are the Glommen, and its affluent the Lougen; the Beina, Lauven, Skien-Nid, and Torrisdal. The most important rivers in the north are the Tana, which forms part of the boundary between Russia and Norway, and falls into the Arctic Ocean; and the Namsen, which falls into the Atlantic. A complete enumeration of the lakes whose magnitude might entitle them to notice is impossible, and it may therefore suffice to mention the Rys Vand, Snaassen Vand, and Miössen Vand.

The prevailing rocks of Norway are gneiss and mica-slate, of which all the loftier mountains are composed. Granite is of comparatively rare occurrence. On some of the plateaux blocks of conglomerate occupy a large part of the surface. Porphyry, argillaceous schist, and limestone occur, but in very limited quantities, and rocks of volcanic formation are rare.

The minerals are both numerous and abundant; and where the means of transport exist can generally be worked to great advantage, both from the facilities which the nature of the ground affords for draining mines, without expensive engines, and the inexhaustible supplies of fuel furnished by the forests. The most important metals are iron, copper, silver, and cobalt, all of which are worked to a limited extent. The only other minerals worthy of notice are chrome, alum, and marble.

That the climate of Norway must on the whole be severe seems necessarily to follow, both from its high latitude and the elevation of its surface. Nearly one-third of the whole country is situated within the frozen zone, and a part of it within the region of perpetual snow. Various causes, however, contribute to modify the temperature, and make it milder than might have been anticipated in the circumstances. One of these is the great extent of sea-coast, so largely increased by the fiords which are in immediate communication with the ocean, the temperature of which is higher than that of the land during the season of winter. The harbours on the west are never blocked up with ice; while in places more inland, though much farther south, as at Christiania, this regularly happens. In general the mountain slopes up to a certain height are clothed with magnificent pine forests, and at lower elevations the oak and the beech are by no means uncommon. Where, from the combined causes of a high latitude and great elevation, the ordinary pasture grasses become scanty, mosses supply their place, and furnish a valuable source of subsistence, and even of wealth, in the numerous herds of reindeer which they maintain. Among the crops cultivated for food the first place is due to barley, which ripens at 70° of latitude; rye is successfully cultivated up to 69°; oats to 68°; but wheat not beyond 64°, and that only in the most favourable seasons. Another most valuable crop is potatoes, grown with success even in Finmark. Hemp and flax are generally cultivated, and in the southern part of the country some tobacco is grown. Fruit, too, particularly the apple, pear, and cherry, is raised generally in all the lower localities of the south and the centre. The grain raised falls very far short of the consumption. One of the most extensive and profitable branches of rural economy is the rearing of cattle, for which many parts of the country are well adapted. The breeds, however, are very inferior. The milk of the cows is said to be very rich, and enters largely into the food of the inhabitants; but the produce must be deficient, as both butter and cheese, as well as beef, form large and increasing articles of import. Sheep are less numerous than goats, and yield a coarse though abundant and warm wool; swine appear not to be viewed with much favour. The horses are vigorous and sure-footed, but of a diminutive size; the ponies are among the best of their kind, and are often exported. Another domestic animal of great value is the reindeer, which forms the principal stock of the northern provinces. Among wild animals are the wolf and bear; deer have become comparatively rare; the smaller kinds of game exist in great variety, and include vast numbers of water-fowl; among birds of prey the eagle occupies the first place.

The fisheries of Norway are of very great value, and mainly contribute to the support of the inhabitants along the sea-board, from the Naze to the entrance of the White Sea. The fisheries are divided into three chief divisions—Lofoden, Romsdal, and Finmark, and include the cod, herring, mackerel, salmon, shark, walrus, seal, and lobster fisheries, the cod and herring fisheries being by far the most important. The total value of the products of the

fisheries considerably exceeds £1,000,000, more than two-thirds of which is for cod. The rivers and lakes abound with salmon and salmon-trout, and make Norway one of the best angling countries in the world.

Manufactures have made very little progress. Cotton, woollen, flax, and silk tissues are made to some extent, but only for home use. Distilleries, brickworks, saw and flour mills, are numerous; and there are several large tobacco-factories and sugar-refineries. The export trade is almost entirely confined to raw produce. The principal items are fish, smoked and dry; timber, whale and seal oil, metals, skins of wild animals, feathers, furs, &c. In recent times lucifer matches have been exported to a considerable extent. The chief imports are grain, butter, beef, woollen goods, cotton, flax, and silk; raw wool, hemp, and flax, salt, sugar, coffee, tobacco, wine, brandy, and vinegar. This trade is chiefly concentrated in the towns of Bergen, Christiania, and Trondhjem, though Drammen, Stavanger, Christiansand, and Arendal likewise have a considerable share. The trade employed in 1881, in addition to foreign ships, 6895 Norwegian vessels of all sizes, with a total burden of 1,453,639 tons. The average value of the imports of Norway in the five years 1878–82 was £8,321,000; of the exports, £5,928,000. Besides the shipping trade, an internal trade of great importance is carried on with Sweden.

Norway being only a portion of the Swedish monarchy, its finances, army, and navy do not require to be separately considered; but as it still retains the name, and many of the realities of an independent kingdom, it will be necessary to attend to its peculiar form of constitution. This, in all its leading features, was fixed at Eidsvold, May 17, 1814; and subsequently, on the union of the two crowns, was adopted, with some necessary modifications, in an extraordinary diet or *storthing*, held on the ensuing 7th Nov. at Christiania. By this constitution Norway is a limited hereditary monarchy, united with Sweden as a free, independent, indivisible kingdom, under one common male sovereign, of the Evangelical Lutheran religion, declared to be the religion of the state. The king has the command of the land and sea forces, and makes all appointments; but, with the exception of the governor-general, is not allowed to nominate any but Norwegian subjects to public offices under the crown. The ministry is composed of nine councillors, each at the head of a separate department; and of two ministers of state. One of the latter, together with two councillors who are annually changed, reside with the king in Sweden; the remaining seven, with the governor-general, reside in Norway. On a new succession the sovereign must be crowned King of Norway at Trondhjem. The members of the legislative assembly, or, as it is called, Storthing (from *stor*, great, and *thing*, court), are elected every three years by the citizens possessing a certain qualification. It subdivides itself into two chambers—one consisting of one-fourth of the members, and called the Lagthing; and the other of the remaining three-fourths, and called the Odelsthing. These chambers meet separately, and each nominates its own president and secretary. Every bill must originate in the Odelsthing, but may be proposed either by the members or by the government. When carried in that court it is sent to the Lagthing, and thence to the king, whose assent makes it a law. If the Lagthing disapprove of the bill they must return it, with the reasons of disapproval, to the Odelsthing. If carried there again, with or without modification, it comes as before to the Lagthing. If the Lagthing reject the measure a second time the whole Storthing meet in one chamber, and the final adoption or rejection is determined by a majority of two-thirds. The veto of the king becomes ineffectual against any measure which has been adopted without modification by three successive Storthings or parliaments.

The great body of the people are Protestants of the Lutheran confession. Though no express law prohibited other religious bodies from meeting for public worship, the popular feeling was for long so decidedly opposed to it that a law, permitting them so to meet, and form regular congregations under their own pastors, was passed for the first time in 1845. Even yet government offices are open only to members of the Established Church. The country is divided into six bishoprics (stifts), corresponding in name and extent with the administrative provinces; and into 902 parishes. With exception of the cathedral of Trondhjem, founded A.D. 1180 or 1183, and a few other churches which are stone edifices, the churches in Norway are generally built of wood. Many of them are very ancient structures, dating as far back as the eleventh and twelfth centuries. Education is compulsory, and is conducted on a national system, according to which gratuitous instruction, of an elementary kind, is placed within the reach of all. The schools, designated by the name of *almue skoler*, or people's schools, are stationed in all towns and parishes. In the country the instruction is only elementary; in the schools themselves an important distinction is made, some being what is called *fast skoler*, or stationary schools, and others *omgangs skoler*, or ambulatory schools. The latter, as their name implies, shift about at certain periods of the year from place to place in the more thinly-peopled districts; and thus have the effect of bringing education to those who, but for this arrangement, would be doomed to live without it. Towns possess, in addition to these people's schools, what are called middle schools, middle and royal schools, burgher schools, Latin or learned schools, in all of which superior instruction is given; there are also four cathedral schools, one each in the towns of Christiania, Bergen, Trondhjem, and Christiansand. At the head of all the educational establishments is the University of Christiania.

The population of Norway is almost entirely of Scandinavian origin. A small number of Lapps and Qvaens dwell in the northern parts. The Norwegians proper are about the middle height, light-haired, and blue-eyed. They show a strong passion for a sea life, and make excellent sailors. The Finns or Lapons dwell in Nordland, and more especially in Finmark, and bear little resemblance to the Norwegians proper. (See LAPLAND.) The Qvaens, though dwelling in the same localities with the Finns, are very easily distinguished from them both by physical features and habits; being generally tall and well-proportioned, and remarkable for their cleanliness. A vice common to all these classes is an excessive fondness for ardent spirits. The Norwegian language, which is sometimes represented as merely a Danish dialect, justly claims for itself a more venerable origin, and is radically identical with the Icelandic, which still bears much affinity with it. In other districts, where Danish or Swedish influence has prevailed, the language has become so adulterated as almost to lose its original character.

History.—The historic period commences with the reign of Harald Harfagar or Haarfager (Fair-hair), who died in 933, and was succeeded by his son Erick, surnamed Bloody Axe, because of his cruelties to his own brothers, and his incessant wars. He was ultimately driven from the throne; and having found an asylum with Athelstan of England, died in possession of the fief of Northumberland. His throne was seized in 938 by his brother, Hako I., who was brought up

in England with Athelstan, and had embraced Christianity. He governed wisely, and, for the most part, peacefully, enacting many valuable laws; and though he failed in a direct attempt to make his subjects renounce paganism, undoubtedly paved the way for its final overthrow. The first distinguished name which occurs among his successors is that of Magnus I., the Good, the son of St. Olaf and Alfhild, an English lady of noble birth. He was called to the throne, by election, in 1036; and having in 1042 succeeded also to the throne of Denmark, united both under one monarchy. He possessed great talents, military and civil; studied the interests of his subjects; and died, universally regretted, of a wound received in hunting. The crowns of Norway and Denmark again passed to different individuals. Harald III., the successor of Magnus, is known in English history as the leader of the expedition which landed on the coast, and, after pillaging the town of York, was defeated by Harold, son of Godwin, shortly before his own more signal defeat at Hastings. Norway had now embraced Christianity, and accordingly, in several of the subsequent reigns, we find the clergy playing a conspicuous part. In the twelfth century the Norwegians had carried the terror of their arms to distant lands; and swayed the sceptre not over Norway merely, but over many parts of the coasts of Britain and the adjacent islands, more especially the Orkneys on the north, and the Hebrides on the north-west of Scotland. They not only paid frequent visits to its eastern shores, but sailed round the west coast, and up the Clyde as far as Largs, where, in 1262, an incursion headed by Hako IV., one of their most celebrated kings, was valiantly repulsed. Hako IV. died shortly after in the Bay of Kirkwall, after a flourishing reign of forty-six years, and was succeeded by his son Magnus IV., the Lawgiver. During his reign the foreign dominions of the Norwegians were considerably abridged by the sale of the Hebrides and the Isle of Man to the Scottish king, Alexander, and their commerce crippled by an injudicious treaty with the Hanse Towns. The clergy had also been permitted to make numerous encroachments; but the next king, Erick II., who came to the throne in 1280, was a man of a different stamp, and from the determination with which he opposed their encroachments bears the surname of Priest-hater. He married first a daughter of Alexander III. of Scotland, in whose right he afterwards laid claim to the Scottish crown; and secondly Isabella, sister of King Robert the Bruce. In 1319 the crowns of Norway and Sweden became for a short time united in the person of Magnus V.—a feeble prince, who had favourable opportunities of establishing a powerful dynasty, but failed to improve them. The next name of importance among the sovereigns of Norway is that of Erick of Pomerania. He succeeded, by separate titles, to Norway, Sweden, and Denmark; and in 1397 was formally crowned king of the three kingdoms of the North. Sweden again became a separate kingdom; but the union between Denmark and Norway was drawn closer and closer, very much to the disadvantage of the latter, which was ultimately degraded into a mere dependency of the former. In a diet held at Copenhagen in 1537, during the reign of Christian III., a formal act was passed declaring that Norway had forfeited its independence. This act was not permitted to remain a dead letter; and the subsequent history of Norway becomes for a long period merely a part of that of Denmark. During the wars consequent on the French revolution, the Danes having leagued themselves with Napoleon, the Norwegians were obliged to follow in their train. They were thus brought into collision with Great Britain, which blockaded their ports, and almost annihilated their trade. When the great coalition against France was formed Denmark refused to join it. Sweden pursued a wiser policy, and stipulated that, in the event of success attending the arms of the allies, Norway should be united with her under one monarchy. After the battle of Leipzig effect was given to the stipulation, in 1814, by the Treaty of Kiel. The summary manner in which Norway was thus bartered away could not but be extremely galling to its inhabitants. At a diet held at Eidsvold, and attended by deputies from all the districts, a limited monarchy, with a strong infusion of the democratic principle, was almost unanimously adopted as the form of government; and Christian Frederick, who had previously been the regent, and was presumptive heir to the throne of Denmark, accepted the crown. His obvious want of ability soon brought matters to a crisis; and the Swedish king, who had used his military success with great moderation, having offered to accept the constitution of Eidsvold, with such slight modifications as the change of dynasty rendered necessary, all resistance to him ceased. His measures, though characterized by great ability and justice, were long regarded with suspicion; but his successors have been fortunate enough to obtain the confidence of their subjects.

NORWICH (anciently *Venta Icenorum*), a city, municipal and parliamentary borough, and bishop's see, England, capital of the county of Norfolk, agreeably situated on the sloping banks of the Wensum, which is here crossed by nine bridges, and immediately below joins the Yare, and on the Great Eastern system of railway, 20 miles west of Yarmouth, 98 miles N.N.E. of London. It was formerly surrounded by walls, fragments of which still exist, flanked with numerous towers, and entered by twelve gates. Owing to the quantity of ground occupied by gardens and orchards the town covers a much larger area than might suffice if it were closely built upon. Though numerous improvements have been effected recently, and many new streets and handsome rows of houses have risen up in different quarters, much remains to be effected; and Norwich, taken as a whole, is still very indifferently built. Not a few of its streets are narrow, winding, and now paved with wooden blocks; and the houses, generally of brick, which line them, or rather overhang them, with their rude pointed gables, are far more remarkable for their antiquity than for the merits of their architecture. Many of the public buildings are well deserving of notice on account both of their intrinsic merits and of the interesting associations connected with them. The cathedral, founded in 1094, and originally Norman, though now exhibiting a somewhat incongruous mixture of styles, is a cruciform structure, with a lofty tower and spire rising from the intersection of the nave and transepts to the height of 315 feet. Few cathedrals surpass it in the imposing effect produced by its interior, in the grandeur of its roof, divided by fourteen semicircular arches, and rendered almost unique by the 328 figures of scriptural subjects sculptured upon it, and in the embellishments and dimensions of its cloisters. Besides the cathedral Norwich possesses about forty churches and over twenty other places of worship. Of the churches the most remarkable are St. Peter's, Mancroft, a large and handsome cruciform structure of the fifteenth century, with a noble tower 98 feet high, containing a peal of twelve bells, considered one of the finest in the kingdom; St. Andrew's, a large edifice in the later pointed style, completed in 1606; St. Clement's, remarkable chiefly for its antiquity; St. George's, Colegate, with a lofty tower built about 1459; St. Giles', one of the finest churches of the

town, wholly rebuilt in the reign of Richard I., in the later pointed style, with a tower surmounted by a battlement and cupola 120 feet high; &c. Several of the churches have been lately restored. Among the Dissenting chapels several are well worth notice, such as that of the Independents in Princes Street, a handsome edifice, with a front in the Italian style; the Baptist chapels of St. Mary's and St. Clement's; and the Wesleyan chapels in Lady Lane and Ber Street, besides others. Among the other public buildings and establishments are the castle, a noble feudal relic, apparently of Norman origin, finely situated near the centre of the city, on a lofty eminence with precipitous sides, and still surmounted by its massive donjon tower, but internally so altered to adapt it to its present use as a jail that little idea can be formed of its original appearance; the Shirehall, built on the inner vallum of the castle; the bishop's palace, and the deanery, large irregular piles adjoining the cathedral, and, like it, approached through what is called the Erpingham Gate, a remarkable structure, consisting of a lofty pointed arch, flanked with semi-octangular buttresses, and enriched with columns, mouldings, and thirty-eight male and female statues in canopied niches; the Guildhall, a large building at the north-western corner of the market, partly fitted up as a courthouse, where the assizes and quarter-sessions are held; St. Andrew's Hall, a noble fabric, originally the nave of the church of the Black Friars' Convent, but now fitted up so as to form one of the largest and most splendid halls for public purposes in this country; the grammar-school, situated within the precincts of the cathedral, and occupying what was formerly the charnel-house, with a colossal statue of Nelson in front; the commercial school, various board and other schools; St. Giles', Doughty's, Cooke's, and the Norfolk and Norwich hospitals, the last occupying a spacious structure of red brick, well fitted up for the convenience and comfort of patients; the lunatic and blind asylums; the Magdalen Institute; the infirmary; an agricultural hall, opened in 1882; the workhouse; the new corn exchange, a large building in the Italian style; chamber of commerce; the assembly rooms; the cavalry barracks; the theatre; Victoria Hall, used for public entertainments; bowling-greens, &c. The literary and scientific institutions include a public library of about 50,000 vols.; a literary institution, with a well-selected library of about 24,000 vols.; a valuable museum, which, along with the literary institute, free library, and school of art, occupies a handsome block of buildings in St. Andrew's Street.

Manufactures are very extensive, and employ the far larger part of the population. Worsted goods, of which a coarse description appears to have been made even before the Norman conquest, were greatly improved by the arrival of Dutch and Flemish settlers at different times, and have ever since continued to form the staple manufacture, though they have assumed a vast variety of forms, and become greatly intermixed with other materials, as cotton, mohair, and silk. The leading articles are shawls, crapes, poplins, and Japanese silks; also coburgs, gauzes, paramattas, challis, camlets, bareges, &c. The making of boots and shoes employs about 6000 persons. There are also mills for spinning woollen, worsted, and mohair yarns; dye-works, vinegar-works, breweries, iron-foundries, machine-works; mustard, starch, and blue works; paper-mills, &c. A large cattle market is held here weekly. There is a considerable trade carried on both by the railways from the city and by the river, which is navigated chiefly by wherries of from 15 to 40 tons to Yarmouth and Lowestoft. Of late vessels of 100 tons have come with cargoes from those parts to Norwich.

The foundation of Norwich cannot be fixed earlier than 446. On the departure of the Romans it was seized by the Anglo-Saxons, and by 1066 had risen to be the capital of the Kingdom of East Anglia. Its castle was originally founded by Uffa at the date last mentioned. By the middle of the tenth century Norwich had become a large and wealthy town, and been divided into several distinct parishes; but in 1002 it was attacked by the Danish fleet, commanded by Sweyn their king, captured, and laid in ashes. It was shortly after rebuilt by the Danes themselves. In the eleventh century it had become a large and populous borough, containing twenty-five parochial churches. In 1294 it acquired new importance by the building of its walls, and in 1296 it began to send representatives to Parliament. In 1328 the foundation of its prosperity was laid by Edward III., who made it a staple town for the counties of Norfolk and Suffolk, conferred upon it other important privileges, and induced great numbers of Flemings to settle in it. A still greater number arrived at a later period during the reign of Elizabeth; and the inhabitants, not only profiting by the lessons thus taught them, but improving upon them, ultimately surpassed their masters, and made their manufactures famous throughout the world. In the more modern history of Norwich there is no event of much interest. It sends two members to Parliament. Pop. of mun. and parl. bor. in 1861, 74,891; in 1871, 80,386; in 1881, 87,842.

NORWICH, a city of the United States, America, in the county of New London, Connecticut, on the Thames, 13 miles north of New London. The falls of the river at this place afford extensive water power, and there are considerable manufactures of cotton and woollen goods, paper, fire-arms, machinery, &c. The city has communication with the seaboard and the interior by two lines of railway, and steamers ply regularly between it and New York. Pop. 15,112.

NOSE, the organ in man and the higher animals exercising the olfactory sense, or that of smell, and which is concerned through its apertures or passages in the function of respiration, and in the production of voice. The bones of the nose comprise the boundaries of the nasal fossæ or cavities, which open in front in the nasal apertures, and behind into the pharynx or back part of the mouth. The front openings of the nose or nostrils are, in the skeleton, of an oval or heart-shape, whilst the openings of the posterior nares or nostrils are of quadrilateral form. The front nostrils are bounded above in the skeleton by the nasal bones of the skull, whilst inferiorly and on each side the palatine bones and ascending processes of the upper maxillary bones form the boundaries to these apertures. The posterior openings are limited inferiorly by the palatal plates of the palate bones, and by the hinder nasal spine, situated at the point of union of these bones. Laterally, the posterior nostrils are bounded by the internal pterygoid plate of the sphenoid bone; and superiorly by the *alæ* or 'wings' of the vomer, and by the body of the sphenoid. The bones which enter into the composition of the entire structure of the nose number fourteen. These may be simply enumerated, their anatomical relations being of too complicated a nature for description in the present instance: two nasal bones, two superior maxillary bones, two palatal, two inferior, and two sphenoidal turbinated bones; the frontal, ethmoid, sphenoid, and vomer.

In addition to this osseous skeleton, certain cartilaginous pieces assist in forming the framework of the nose. These latter comprise *lateral cartilages*, of which two—an upper and lower—exist on each side. The upper lateral cartilage is of triangular form, and is attached superiorly to the nasal and upper maxil-

lary bones; in front to the cartilaginous septum or partition of the nose; and below to the lower and companion lateral cartilage. The lower cartilages are each of curved shape, and are sometimes termed the pinnal cartilages, or cartilages of the alæ, since they form the lower and curved boundary of the nostrils. At the posterior portion of each of the lower lateral cartilages, and imbedded in the fibrous tissue by which each cartilage is attached to the upper maxilla, three or more small cartilages disposed in a row, and termed the *sesamoid cartilages*, are found. The *cartilage of the septum* generally exists in the middle line of the nose, but may also be directed more or less obliquely. It possesses a nearly triangular shape, its surfaces being flat and smooth. The bony *septum*, or partition of the nose itself, is formed chiefly, and in the middle, by the perpendicular plate of the ethmoid bone; behind by the vomer and the 'rostrum,' or process of the sphenoid; and inferiorly by the median ridge or crest of the upper maxillary and palate bones. Like the cartilage of the septum, with which it unites to form the complete partition of the nose, the bony septum may lean to one side. It is perforated by apertures for the transmission of blood-vessels and nerves. Occasionally the septum may be perforated, so that the two nasal fossæ or cavities may communicate with each other.

The muscles which are concerned in the movements of the nasal cartilages include the *triangularis* (or *compressor*) *nasi*, which arises by its apex from the superior maxillary bone, and is inserted into a fibrous aponeurosis spreading over the front ridge of the nose. The fibres of the muscle of one side may unite with those of the opposite and companion muscle. The *depressor alæ nasi* of each side also arises from the superior maxillary bone, and is inserted into the septum and posterior part of the alæ of the nose. The former of these two muscles appears to increase the breadth of the nose, and thus may open, dilate, or expand the nostrils; the action of the latter muscle is that of a true compressor of the nostrils, each of the depressors drawing its ala or side of the nostril downwards. The *dilatator naris posterior* and the *dilatator naris anterior* of each side are delicate muscular slips, and by their action tend to dilate the nasal apertures. The *pyramidalis nasi*, extending down the side of the nose, depresses the inner angle of the eye, and at the same time raises or elevates the skin of the nose at the alæ. The *levator labii superioris alæque nasi* lies on the side of the nose, between the inner side of the orbit and the upper lip. When in action this muscle dilates the nose, raises the upper lip and alæ of the nose; its use being well seen in the expression of a derisive smile, and in the wrinkling of the skin at the angles of the nose and mouth.

The *skin* of the nose is of delicate and smooth character. The papillæ or minute elevations of the true skin in the neighbourhood of the nose are described as being of smaller size than ordinary, whilst the upper skin or cuticle is of more than usually thin nature. The hairs of the skin are also of finer nature than in the other regions of the body; and the sebaceous or skin glands are very numerous, and possess short ducts, whilst their secretion is generally present in very abundant quantity. It is in this situation that the harmless little parasite, one of the *Acarina* or mites, and known as the *Demodex folliculorum*, is chiefly found, inhabiting the follicles and ducts of the cuticle.

Turning to the internal conformation and structure of the nose, attention must be directed to the three *meati* or compartments of the nose, which are formed in the outer wall or side of each of the nasal cavities by the *turbinated bones*. These compartments are of unequal size, and they communicate by apertures with certain spaces known as 'air-cells' or *sinuses*, existing in the frontal, sphenoid, superior maxillary, and ethmoid bones. The *upper or superior meatus* is the smallest compartment, and occupies the posterior part of the nasal wall. It communicates with air-cells known as the posterior ethmoidal and sphenoidal sinuses. The *middle meatus* is a little larger. It communicates anteriorly through a passage or *infundibulum* with the anterior ethmoidal and frontal sinuses. The *inferior meatus* is the largest cavity, and occupies the greater part of the outer nasal wall. Into the front portion of the inferior meatus the *nasal duct* opens; this canal conveying the tears or *lachrymal secretion* from the eye to the nose. Posteriorly to the extremity of the inferior meatus the aperture of the *Eustachian tube*, leading from the ear, may be seen. The nasal duct (see EYE) takes origin from the *lachrymal sac*, which is situated at the upper and outer angle of the orbit; and the termination of the nasal duct in the nose is protected by a fold of mucous membrane, which acts as a valve, and so prevents air from distending the lachrymal sac when inhaled by the nostrils. The latter sac and the nasal duct possess a lining of ciliated epithelial cells.

The *mucous membrane* lining the nostrils and nasal cavities is also known as the *Schneiderian* or *pituitary membrane*. It extends throughout the nasal sinuses, into the pharynx, into the nasal ducts and orbits, and through the Eustachian tubes, into the tympana and mastoid cells of the ear. It is firmly adherent to the periosteum or membrane covering the nasal bones and passages. The mucous membrane is thicker and more vascular at the part which overlies the lower turbinated bones and the lower half of the septum of the nose than elsewhere. This thickness is the result of the presence in these situations of plexuses of minute arteries and veins in the submucous layer or tissue of the membrane. In the nasal sinuses the Schneiderian membrane is thin, and of paler colour. The mucous ducts of the membrane are branched, and form a nearly continuous and connected layer; and their ducts open by numerous apertures on the surface of the membrane. The vascularity of the membrane and its numerous ducts tend to furnish and maintain the copious mucous secretion of the nose, which protects the delicate membrane, and keeps it in the moistened state favourable to the due and perfect exercise of its functions. The mucous membrane of the nose is further covered at the nostrils by a layer of *squamous* or *pavement epithelium;* whilst in the sinuses and lower portions of the nose the membrane is provided with a layer of ciliated epithelial cells of the columnar variety. In the upper part of the nose, corresponding to the upper and middle turbinated bones and the ethmoidal portion of the septum—and termed the *olfactory region*, from the distribution at this part of the olfactory nerves—the mucous membrane has a covering of epithelial cells of the columnar variety, but non-ciliated. And beneath this layer, and also between the columnar epithelial cells, nucleated or *olfactory* cells are found. These latter cells form the terminal points as it were of the delicate ultimate filaments of the *olfactory nerves*, or the *nerves of smell;* and in this way the odoriferous particles drawn into the nostrils, and brought in contact with these cells, stimulate through them the olfactory nerves, and produce the sense or impression of smell.

The *olfactory nerves* form the first pair of *cerebral nerves*, or those which take origin from the cerebrum or brain proper. They proceed from the *olfactory bulbs*, which are situated beneath the anterior or front lobes of the *cerebrum*. These bulbs are viewed as vesicular prolongations of the brain, and are gener-

ally of larger size in lower mammals than in man. The olfactory nerves in their minute or microscopic structure—as noticed in the article NERVOUS SYSTEM—exhibit a difference from ordinary nerve-fibres, in that they possess no *medullary sheath*, and consist of nucleated cells; and they consist each of a collection of delicate filaments, which are distributed chiefly to the olfactory region of the nose already described. They number about twenty on each side, and pass to be distributed in the nose, through the foramina or apertures in the cribriform plate of the ethmoid bone. The olfactory nerves are thus nerves of special sense; and the nose receives its nerves of common sensibility from the fifth pair of nerves. The nerves of common sensibility are quite distinct and separate from those of smell. In cases where from disease, or the presence of lesions of any kind, the sense of smell is lost, the sensibility of the nose is not affected. And from the intimate relations existing between the senses of smell, taste, and touch, it is frequently difficult to exactly determine or distinguish between sensations or impressions, such as those of a pungent or acrid nature and those resulting from the stimulation of the nerves of smell alone. Very great differences are observable in the exercise of the olfactory sense by different individuals; and abnormal or diseased cerebral conditions may affect this sense in peculiar ways. A constant sensation of a disagreeable odour was thus present to an individual whose brain after death was found to be diseased; and a fall from a horse was mentioned by Dubois to have produced a similar result in a case which came under his observation.

The study of the comparative anatomy of the nasal organs shows us that man possesses a sense of smell greatly inferior in very many instances to that possessed by the lower animals. The distribution of the olfactory nerves in man is of a very limited nature when compared with what obtains in such animals as the dog, sheep, &c. And amongst these lower forms great differences are apparent in the kinds or qualities of odours most readily perceived or appreciated. The Carnivorous Mammalia will in this way be most susceptible to the odours of other animals, and the Herbivorous forms to those of plants.

All Vertebrates above fishes generally resemble man in the essential type of their olfactory apparatus. The Cetacea, however, appear to want an olfactory organ. In fishes, with the exception of the Myxinoids and Lepidosiren, the nostrils are simply shut or closed sacs, and do not communicate posteriorly with the mouth. The nostrils may open externally in a single aperture, as in the porpoise, &c.; whilst its posterior or hinder opening may be situated far down the throat, as in the great ant-eater (*Myrmecophaga*). In some forms (for example, Bats) peculiar leaf-like appendages may be attached to the nose. In the Lampreys, and Myxinoids or hag-fishes, the nostril is single and median in position. In the mole and hog a special ossicle or bone, median in its position, may be present in the snout. The familiar proboscis of the elephant exemplifies a singular elongation of the nose, in which the organ becomes modified for tactile purposes, and also for the exercise of prehensile functions. In the seals, Ornithorhynchus, and in other diving animals the nostrils can be closed at will by sphincter muscles or valvular processes. In Cetaceans the nostrils or 'blow-holes' are intimately associated with respiration, and with the expulsion of water, a function for which a complication of structure, muscular and otherwise, is provided.

The most frequent diseases or abnormal conditions which affect the nose comprise congenital defects, and tumours or polypi. The congenital defects include cases of entire *non-development* of the part, of *fissure* of the nose, and of a *proboscis-like* development. Nasal *polypi* or tumours may exist in the form of *simple* outgrowths from the mucous membrane, or of *malignant*, *vascular*, or *bleeding* polypi; the latter generally occurring in advanced life. The *fibrous* polypi are of firmer consistence, and require much greater care and skill for their removal, an operation not always attended by success or cure. The nose and its cartilages are also liable to be affected by general diseases, among which *lupus* or *noli me tangere*—an obstinate ulceration often resulting in the entire destruction of the organ—may be mentioned. Syphilis may also affect the nose, in the form of an ulcerative process, and cancer sometimes, although more rarely, occurs. Bleeding from the nose or *epistaxis* is a common affection, existing primarily; or it may be a symptom attendant on the growth of polypi. The nose may be restored by an operation, wherein a flap of skin dissected from the arm is modelled to the nose, and means taken to insure its due and natural growth in the new situation. This operation is known as that of *Taliacotius*, an Italian surgeon who first practised it. The Indian method consists in dissecting the flap of skin from off the forehead, and of adjusting it to the situation and requirements of the lost feature.

NOSOLOGY (from the Greek *nosos*, disease), in medicine, that science which treats of the systematic arrangement and classification of diseases. Many systems of nosology have been adopted at different times, such as those of Sauvages, Cullen, Mason Good, Pinel, and others, some of which have been founded on the nature of the ascertained cause of diseases, others on the pathological conditions which attend diseases, others, again, on the differences between structural and functional diseases, and so on. The system introduced by Dr. William Farr appears to have the advantage over all others of showing those causes that are injurious or fatal to life, and thus contributing to the removal of those evils (overcrowding, imperfect drainage or ventilation, &c.) which tend to destroy health. This system is the one adopted by the registrar-general in his reports on the mortality of London and England, and seems destined to become in a short time the most widely recognized. This system of nosology is divided into four primary classes, which are subdivided into various orders.

Class I.—Zymotic Diseases, diseases that are either epidemic, endemic, or contagious, induced by some specific body, or by the want of food or by its bad quality. In this class there are four orders. Order I.—Miasmatic diseases, such as small-pox, measles, scarlatina, diphtheria, croup, hooping-cough, scarlet, typhus, typhoid, and yellow fevers, cholera, ague, boils, erysipelas, dysentery, rheumatism, diarrhœa, &c. Order II.—Enthetic diseases, such as syphilis, gonorrhœa, hydrophobia, leprosy, glanders, &c. Order III.—Dietic diseases, such as famine fever, scurvy, rickets, cretinism, delirium tremens, &c. Order IV.—Parasitic diseases, as itch or scabies, worms, scald-head, &c.

Class II.—Constitutional Diseases, those affecting several organs, in which new morbid products are frequently deposited; sometimes hereditary. This class is divided into two orders. Order I.—Diathetic diseases, such as gout, dropsy, cancer, canker, mortification, dry gangrene, &c. Order II.—Tubercular diseases, as scrofula, phthisis, mesenteric tuberculosis, &c.

Class III.—Local Diseases, those in which the functions of particular organs or systems are disturbed or obliterated, with or without inflammation; sometimes hereditary. This class contains eight orders.

Order I.—Diseases of the brain, or rather of the nervous system, as apoplexy, paralysis, mania, epilepsy, hysteria, neuralgia, convulsions, &c. Order II.—Diseases of the heart or circulatory system, as carditis, valvular disease of heart, aneurism of heart and of aorta, fainting, varicose veins, &c. Order III.—Diseases of the lungs or respiratory system, as bronchitis, laryngitis, pleurisy, asthma, pneumonia, tuberculosis, phthisis, &c. Order IV.—Diseases of the bowels or digestive system, as gastritis, enteritis, jaundice, constipation, dyspepsia, pancreatic disease, &c. Order V.—Kidney diseases, as stone, gravel, diabetis, Bright's disease, &c. Order VI.—Genetic diseases, as varicocele, uterine tumours, ovarian tumours and dropsy, &c. Order VII.—Bone and muscle diseases, as caries, spinal curvature, necrosis, exostosis, soft and brittle bones, muscular atrophy, &c. Order VIII.—Skin diseases, as roseola, eczema, whitlow, impetigo, acne, &c.

Class IV.—Developmental Diseases, special diseases, the result of the formative, reproductive, and nutritive processes. This class includes four orders. Order I.—Developmental diseases of children, as malformations, idiocy, congenital deaf-dumbness, teething, &c. Order II.—Developmental diseases of women, as chlorosis, childbirth, paramenia, climacteria, &c. Order III.—Developmental diseases of old people, as old age and its concomitant affections. Order IV.—Diseases of nutrition, as atrophy, debility, &c.

NOSSI-BÉ, Nosbé, or Variou-Bé, an island of South Africa, off the north-west coast of Madagascar, belonging to France. It is in the form of an irregular parallelogram, about 14 miles long by 8 miles broad, has a mountainous surface, the culminating point, Loucoubé, near its centre, attaining a height of above 1800 feet, and evidently appears, both from its general structure and numerous extinct craters, to be of volcanic origin. It is well watered and well wooded, and so fertile as to maintain a population of 8155 souls. Rice, maize, manioc, and bananas are the principal products, and the sugar-cane and the coffee-plant are successfully cultivated. It has a harbour of sufficient depth to float the largest vessels, and capacious enough to receive whole fleets.

NOSTALGIA, or Home Sickness, a peculiar affection of the mind, to which the natives of mountainous countries specially (such as the Scotch Highlanders and the Swiss) are liable during a prolonged absence from their homes. They are seized with a vehement desire to return home, and if this is not gratified, melancholy, loss of sleep and appetite, somnambulism, emaciation, and frequently mania and disease of the lungs supervene. The emotion is liable to be excited by whatever recals forcibly to the mind the beloved scenes; national music does this very strongly, so much so, indeed, that it has been found necessary to prohibit for a time the performance of certain airs when troops have been stationed abroad.

NOSTOC, a genus of plants of the natural order Algæ, suborder Confervacæ, found upon swampy soils, rocks near streams, &c., and consisting of a gelatinous hollow tumid frond, filled with simple filaments having the appearance of strings of beads. *Nostoc commune* is found in Britain, and is popularly known under the name of Star Jelly; it is a trembling gelatinous plant, which springs up suddenly after rain, and is supposed by the ignorant to be efficacious in healing wounds and pains of the joints. The Chinese use the *Nostoc edule* as an article of food.

NOSTRADAMUS (Michel de Nostredame), a celebrated French physician and astrologer; born at St. Remy (Provence), in 1503. He belonged to a Jewish family, several of the members of which had gained some reputation in the medical profession. He studied first at Avignon, and afterwards at the medical school of Montpellier. Here he acquired distinction during an epidemic that desolated the south of France, by his unwearied and successful endeavours to arrest the disease. After taking his degree he acted for some time as a professor, but was induced by his friend J. C. Scaliger to settle as a medical practitioner at Agen, where he married. Having lost his wife and two children at the end of a few years, he quitted Agen, and travelled for some time in Italy. He married a second time, and settled at Salon, near Aix, about 1544. During a fresh outbreak of pestilence at Aix and at Lyons, he was solemnly invited by the authorities of those towns to give his invaluable services for the saving of human life, and extended his reputation for medical skill and philanthropy, in spite of the calumnies of his less successful and envious brethren. On his return to Salon he set about writing the work to which he owes his celebrity. It appears he was unwilling at first to publish it, but at last, in 1555, the famous Prophéties were published at Lyons. These prophecies were written in rhymed quatrains, and subdivided into seven centuries; the second edition (1558) contained ten. The predictions are couched in obscure language, but obtained great success, although many men condemned their author as a quack. Catharine de' Medici invited him to court to cast the horoscope of her sons; the Duke of Savoy travelled to Salon for the express purpose of visiting him, and on the accession of Charles IX. he was appointed royal physician. In 1550 he published an almanac containing predictions about the weather, the first of a numerous family of such productions. He died at Salon in 1566.

NOSTRILS, Diseases of the. One of the most common of the diseases of the nostrils has been already described under the heading Catarrh. Another common one is bleeding, hemorrhage or epistaxis, which may be produced by a direct injury, as by a blow on the nose, or a scratch in the interior of the nostrils; or it may be an active hemorrhage, in which case it is frequently preceded by a feeling of tension and heat in the nostrils, pain in the forehead, giddiness, buzzing in the ears, flushing of the face. All these symptoms are not often present in the same case, and in many instances the flow of blood is not preceded by any apparent disorder. Epistaxis may also be of a passive character, and due either to a morbid state of the blood, as in typhoid and typhus fevers, malignant scarlatina, purpura (popularly known as the purples), scurvy, &c., or to obstruction of the circulation by disease of the heart and liver. Bleeding from the nose in persons advanced in life must be much more cautiously interfered with than in the young. If the person so affected is plethoric, the hemorrhage is evidently of an active character, and is a natural relief. It may, however, go to an extreme extent, and require checking. Many methods of effecting this are had recourse to, but cold applied to the forehead, spine, or other parts of the body is the most general. Raising both arms suddenly above the head has been said to stop the flow quickly, or a small quantity of solution of alum, as strong as it can be made, may be thrown up with a syringe, or a piece of linen soaked in the solution may be stuffed up the nostril. From ten to fifteen drops of dilute sulphuric acid may be given in water at intervals, according to the nature and persistence of the attack. Should these means fail, direct compression must be resorted to. Polypus, a tumour, the result of the morbidly excessive growth of the mucous membrance, is of frequent occurrence in the nostrils. It is treated of under a separate heading.

NOTA, Alberto, a modern Italian dramatic poet, born at Turin in 1755. He was carefully educated, and his great native talents were thus early developed. After studying law he practised for a long time as an advocate, and held several important appointments under government until the political circumstances of Italy obliged him to retire from public life. He again, however, accepted a civil appointment, and was successively intendant and general-intendant in several towns. He died at Turin in 1847. His eventful life and an unhappy marriage are said to have thrown a gloom over his temper. The comic element is weak in him, the plot is usually very simple, and the events are taken from ordinary life. On the other hand he excels particularly in his delineations of character, and even the most irregular natures are presented by him with extraordinary skill. Of his numerous theatrical pieces, La Fiera, a graphic and amusing description of manners, is perhaps the best. A collection of his works, under the title of Comedie, appeared at Florence in seven vols. in 1824. Many of them have been translated into French, Spanish, German, &c.

NOTABLES (*les notables*), in French history, signifies the deputies of the states who were appointed and convoked by the king. In the early history of that country mention is several times made of the notables; but the first assembly of any importance was in 1558. From 1626 no such assembly was again called, till in 1786 the minister and controller-general Calonne conceived the idea of summoning the notables for the purpose of effecting several arrangements which he considered necessary: and there were accordingly assembled, by an *ordonnance* dated December 29, 1786, seven princes of the blood, nine dukes and peers, eight field-marshals, twenty-two noblemen, eight counsellors of state, four masters of requests (*maîtres des requêtes*), eleven archbishops, thirty-seven chief justices, twelve deputies of the *pays-d'états*, the civil lieutenant and twenty-five magistrates of the different cities of the kingdom, making in all 144 persons. After this assembly had continued its sessions from February 22 to May 25, 1787, it separated, and the following results of their labours were published:—1. The provincial assemblies were established according to a plan proposed by the notables; 2, the council of finance was organized as they wished, and was to publish annual reports of the receipts and expenditures, and also of the pardons and pensions; 3, the abolition of the *corvées;* 4, the abolition of the tolls and other obstacles to a free passage through the interior; 5, the abolition of the salt tax, which was to take place by degrees, as the revenue was improved by retrenchments, &c.; 6, freedom of the corn trade, and of the internal trade in general; 7, careful improvement in all departments, and a yearly retrenchment of at least £4,000,000; 8, retrenchment in the household of the queen and princes; 9, a yearly loan of 50,000,000 livres; 10, a yearly tax of 50,000,000 upon such articles as would render it least burdensome to the people; 11, the provincial assemblies were not to consent to the imposition of any new tax till the retrenchment should amount to £40,000,000. This assembly forms an epoch in the modern history of France. A second meeting of the notables was called in November, 1788, to consult on the manner of assembling the states-general.

NOTARY (Latin, *notarius*, from *nota*, mark) originally denoted, with the Romans, those slaves or freedmen who acted as stenographers (making use of certain abbreviations, signs, *notæ*), particularly in the meetings of the senate. In later times the *notarii* were the secretaries of public authorities. From the Romans the name passed over to the nations of Western Europe; and in modern times a *notary* is a witness, appointed as such by government, whose testimony is in some cases useful, to give credibility to instruments; in other cases is required by law to give them full validity, as, for instance, in protests of bills of exchange, &c. In France the importance of the notary was, and still is, greater than anywhere else. He is not only a public witness for every one who wishes his testimony, but he is also the great witness of government. He makes all contracts, mortgages, and other deeds and conveyances, where the property in question amounts to more than 150 francs. The instruments of a notary have full authority, and no testimony against them is permitted; and the originals are preserved and registered by himself, the parties retaining only copies. The notaries also perform an important part in the division of inheritances, make the inventories, direct the business, and make a report of what has been done.

In England and the United States a *notary public* is a person who publicly attests deeds, or writings, to make them authentic in another country; but he principally acts in business relating to commerce; makes protests of bills of exchange which are not accepted or not paid; attests the statements of masters of ships in regard to the damage which their vessels have suffered, &c.

NOTATION, Chemical. See Chemistry.

NOT GUILTY is the general issue or plea of the accused in a criminal action. When a prisoner has pleaded not guilty he is deemed to have put himself on his country for trial, and the court may order a jury for the trial of such person accordingly. Should he refuse to plead, or stand mute, the court may direct the proper officer to enter a plea of not guilty on his behalf, which has the same effect as if he had actually pleaded. Should the prisoner make a simple and plain confession of guilt, the court has nothing to do but to award punishment; but it is generally backward in receiving and recording such confession, and it mostly counsels the prisoner to retract it, and plead to the indictment. On an indictment for murder a man cannot plead that it was in his own defence, but must answer directly by the general negative, not guilty; the effect of which is, that it puts the prosecutor to the proof of every material fact alleged in the indictment, and it allows the prisoner to avail himself of any defensive circumstance as fully as if he had pleaded them in a specific form. If an English jury finds that the charge against the prisoner has not been satisfactorily proved they return a verdict of not guilty, and he is discharged.

NOTICE TO QUIT. See Landlord and Tenant.

NOTO, a town of Sicily, in the province of Syracuse, and 14 miles south-west of the city of that name, on a height above the left bank of the Noto, near its mouth in the Ionian Sea. It was a place of great strength under the Saracens, and held out against the invading Northmen longer than any other Sicilian city. It is one of the most agreeably situated and best-built towns in the island, and contains several churches and convents, an hospital, college, and museum, rich in rare Greek, Roman, and Moorish coins; and some trade in corn, wine, and oil. Its site is said to be unhealthy. Pop. 18,202.

NOTOCHORD, or Chorda Dorsalis, the structure which is developed in the early or embryonic life of every *vertebrate* animal, and which, in most instances, becomes or is replaced by the spine of adult existence. In the early development of the vertebrate egg or ovum the dorsal or upper surface of the embryo becomes elevated to form two ridge-like projections, inclosing between them a depression,

termed by embryologists the *primitive groove*. In the floor of this groove a rod-like structure of soft cellular consistence and texture is developed. This rod, tapering towards each extremity, is the 'notochord,' and it remains persistently in this condition until a comparatively late period of development. The edges of the primitive groove soon unite, and convert the groove into a canal—the neural or cerebro-spinal canal of the vertebrate body—which incloses and protects the brain and spinal marrow of mature existence. And as development proceeds the notochord, in the great majority of instances, is replaced by the bony spine of adult life; but in some cases, as in the little fish known as the Lancelet (which see) the notochord remains or persists throughout life in its embryonic condition. In the Marsipobranchiate Fishes (Lampreys and Hagfishes) the notochord is also persistent throughout life, and no backbone is developed. In some Ganoid Fishes the notochord similarly persists, and in the Elasmobranchii (Sharks, Rays, &c.) the development of a true spine may be incomplete. In the mature condition of the spine, the notochord of early life is represented by the intervertebral discs or matter situated between the bodies of the vertebræ, or joints of the backbone. No invertebrate form possesses any structure at all comparable to the notochord of vertebrates. And hence the presence of this structure in early vertebrate existence constitutes a character of the highest and most stable value in the definition of the Vertebrate sub-kingdom.

NOTORNIS, a genus of Grallatorial or Wading Birds, found inhabiting the South Island of New Zealand. It was first known to science by the discovery of fossil remains; and to these fossils the name of *Notornis Mantelli* was given by Professor Owen. Subsequently, however, the genus was found to be still represented by living forms. The Notornis is most nearly allied to the Coots. It is, however, of larger size than these birds, and differs from them in the rudimentary nature of the wings—a conformation in which it agrees with many other extinct as well as living birds found in New Zealand.

NOTOTHERIUM, an extinct genus of marsupial or kangaroo-like animals, the fossil remains of which are found in deposits of Upper Pliocene age in Australia. This form, whilst exceeding living kangaroos in size, was yet smaller than many extinct and neighbouring genera (for example, *Diprotodon*). It was of herbivorous habits, and appeared to unite the characters of the Kangaroos with those of the Koala or kangaroo bear. The *Nototherium Mitchelli* is a described species of this extinct genus.

NOT PROVEN, in Scotch law, a verdict returned by the jury when there is not sufficient evidence to convict the prisoner at the bar, while there is some apparent foundation for the charge. On this verdict being returned the accused is liberated, as in the case of not guilty, and cannot be tried afterwards for the same offence, though new and conclusive evidence should turn up after the verdict.

NOTRE DAME (French, Our Lady), a title of the Virgin Mary. It is the name of many churches in France, and particularly of the great cathedral at Paris, which was founded in the twelfth century, and forms a prominent object in the history of the city. It has been recently restored with great splendour, and in addition to the two towers which flank the west entrance, and the summits of which command a magnificent view of Paris, the transept has been surmounted by a beautiful spire. A vivid picture of Notre Dame in the fifteenth century is given by M. Victor Hugo in his celebrated novel of that name.

NOTTINGHAM, or NOTTINGHAMSHIRE, an inland county of England, bounded, north by York, east by Lincoln, south by Leicester, and west by Derby. Area, 527,752 acres, of which about 454,000 are arable, meadow, and pasture. The general surface, with exception of the Vale of Trent, is undulating, but none of the eminences reach any great elevation. The principal river is the Trent, with its affluents, the Soar and Idle. The highest grounds are Annesley Hills and Sherwood Forest. The south-east border is chiefly occupied by the lias rocks; the greater portion if its area being composed of rocks of the permian and new red sandstone systems. The chief minerals are coal, gypsum, and stone of various kinds. The soil consists of sand, gravel, and red marl, and with few exceptions is extremely fertile. The ancient forest of Sherwood, which extended about 25 miles, with a breadth varying from 6 to 9 miles, covered the greater part of the sandy soil in the north-west, and is still called the forest district. The crops usually cultivated are wheat, rye, barley, oats, beans, and pease. In 1883 there were 142,305 acres under corn crops, 50,151 under green crops, and 54,864 in clover and grasses under rotation. There is a considerable breadth of excellent grass land and meadows in the vale of the Trent, employed for feeding and dairy purposes. There were 15,191 agricultural horses, 76,229 cattle, 211,893 sheep, and 30,371 pigs in the county in 1883. The manufacturing districts centering in the county town are celebrated for lace, hosiery, and the manufacture of highly-finished machinery in connection therewith. Silk and cotton spinning, bleaching, brick-making, coal-mining, iron and brass founding, glove-making, and other branches of industry are well developed. The agricultural districts centering in Newark, Retford, and Mansfield, owe their prosperity to an increasing trade in corn, malt, hops, stone, lime, gypsum, and plaster of Paris. The county returns four members to Parliament, and two each for the boroughs—Nottingham, Newark, and East Retford. Pop. in 1861, 293,867; in 1871, 319,758; in 1881, 391,815.

NOTTINGHAM, a town of England, capital of the above county, on the Leen, near its junction with the Trent, and also on a branch line of the Great Northern Railway, 122 miles N.N.W. from London by rail. It occupies a picturesque site on the broken declivities and occasionally abrupt precipices of a sandstone rock overlooking the Vale of Trent; and from whatever quarter it is approached, but more especially on descending Ruddington Hill from the London side, presents a striking and attractive appearance; its castle and St. Mary's church forming the two prominent objects in the view. The ancient portion of the town is indifferently built, consisting of narrow tortuous streets and closely packed courts and alleys teeming with population; recently, however, considerable improvements have been effected by the widening of several thoroughfares and the removal of narrow streets, lined with miserable dwellings, in the denser localities. The modern portions consist of broad streets and spacious thoroughfares with well-built houses, factories, and public buildings. Ample provision has been made for the recreation of the people by public pleasure-grounds, the Arboretum, Elm Avenue, and other promenades, with race and cricket grounds, being the most conspicuous. The great market-place, described by Leland as the fairest without exception in all England, and the grounds of the castle, may also be noted as places of public resort and interest. Among the remarkable buildings the castle is conspicuous. It crowns the summit of a precipitous rock which rises 133 feet above the level of the Leen, and which is perforated by numerous holes and vaults. The original castle was built by William the Conqueror as a means of overawing

and repressing the bold outlaws frequenting the recesses of Sherwood Forest. It was dismantled during the Protectorate, and subsequently became the property of the Duke of Newcastle, who in 1674 erected on part of the site a large mansion, having nothing of a castle but the name. After having been destroyed by a body of rioters during the excitement connected with the Reform Bill of 1832, the castle has been restored and adapted for the Midland Counties' Art Museum, which was opened with great ceremony by the Prince of Wales, 4th July, 1878. It now contains the fine arts and industrial exhibitions, the free museum of natural history, free and reference libraries, reading-rooms, &c. Among the churches we must first mention St. Mary's, an ancient and venerable structure, supposed to have been originally erected in the seventh century. It has been rebuilt and restored at various times, and is rendered conspicuous above all the other buildings by the eminence on which it stands, and its lofty, massive, and majestic tower. St. Peter's is an ancient Gothic edifice, surmounted by a neat tower, terminating in a plain spire; St. James's has a square pinnacled tower; St. Paul's is in the Doric style, with a handsome portico; Trinity, St. John's, St. Andrew's, St. Saviour's, and All Saints' are handsome modern structures. Among the other places of worship the most conspicuous are the Roman Catholic cathedral, a spacious, cruciform, and highly decorated structure, with numerous windows of richly stained glass, and a central tower terminating in a spire 150 feet high; the Derby Road Baptist meeting-house, and the Unitarian chapel on the High Pavement. Other buildings deserving of notice are the exchange, a large building fronting the market-place, the County Hall, with county jail attached; the Guildhall, and the house of correction, a large edifice built on the site of a convent of the Knights of St. John, and recently considerably improved in outward decoration; the union workhouse, corn-exchange, chamber of commerce, Mechanics' Hall, Albert Hall, school of art, post-office, county courts, theatre, the drill-hall of the Robin Hood Rifles, one of the finest volunteer regiments in the country; a splendid pile of buildings known as University College, the day and evening classes of which, and of the Technical School attached, are attended by large numbers of students both male and female; and various important factories and warehouses connected with the staple trades of the town. Two iron bridges of great strength and beauty, the new Trent Bridge and the Wilford Bridge, both opened in 1871, also deserve to be mentioned.

The principal educational and literary institutions are the high-school for boys, well endowed, and occupying a large and handsome building; the Blue-coat School; the University College and Technical School already mentioned; the government school of design, the People's Hall, and the Mechanics' Institute. Among charitable institutions are the general hospital, the dispensary, the Midland institute for the blind, and the general lunatic asylum.

The staple manufactures to which the town mainly owes its prosperity and rapid increase are hosiery and lace. The former first began to assume importance about the middle of the eighteenth century, and the latter in 1778, when the point-net machine was invented. The bobbin-net machine was invented about 1799, but did not come into general use till 1823. These manufactures were long carried on exclusively in the homes of the workmen, but large steam factories have been gradually erected, and have now almost entirely superseded domestic labour. In addition to the staple manufactures, including the machine-shops and other industrial establishments more immediately dependent on them, a considerable number of hands are employed in the cotton and woollen manufactures; in silk, worsted, and cotton spinning-mills; and in making articles of malleable and cast iron.

Nottingham is believed to have been a Roman station. It afterwards belonged to the Kingdom of Mercia. It was walled by Edward the Elder, and acquired a great addition to its importance on the erection of its castle by William the Conqueror. Charles I. raised his standard here after he had decided on an open contest with the Parliament in 1642. In more modern times it has acquired a rather unenviable notoriety by the frequency and violence of its riots. The most memorable of these were the Luddite riots, which were so skilfully organized that the rioters succeeded in escaping the vigilance of the law, and they were so pertinaciously persisted in for a number of years, that Parliament was obliged to pass an act making it death to break a stocking or lace frame. The riots of 1831, for which the rejection of the reform bill by the House of Lords was made the pretext, destroyed property above the value of £50,000. The borough sends two members to Parliament. Pop. of parl. bor. in 1871, 86,621; in 1881, 111,648; of municipal bor. in 1881, 186,575, the boundaries having been greatly extended in 1877.

NOTTINGHAM, HENEAGE FINCH, FIRST EARL OF, was the son of Heneage Finch, recorder of the city of London, and was born in 1621. He was educated at Westminster School and Christ Church, Oxford, whence he removed to the Inner Temple. At the restoration of Charles II. his reputation as a lawyer raised him to the post of solicitor-general, in which capacity he signalized his zeal in the prosecution of the regicides. In 1661 he was elected member for the University of Oxford, and obtained a baronetcy, and six years afterwards took a prominent part in the impeachment of the Earl of Clarendon. In 1670 he became attorney-general, and in 1673 succeeded the Earl of Shaftesbury as lord-keeper. This latter appointment was only a step towards the chancellorship which he obtained two years afterwards. In 1681 his services were rewarded with the earldom of Nottingham. He survived his elevation, however, little more than a year. His powers as an orator were highly rated; and Dryden has handed down to posterity his portrait in Absalom and Achitophel, under the character of Amri. Several of his speeches on the trials of the judges of Charles I. have been published, as have also some of his parliamentary orations.

NOUN (from the Latin *nomen*, name), in grammar, the name of a thing, or more accurately, the name of a conception, whether general or particular. As we may have conceptions of substance or of attribute, nouns are either *substantive* or *adjective*. Again, as we have particular conceptions, or conceptions of individuals, and general conceptions, or conceptions of classes of individuals, nouns are either *proper* or *common*. In order to express unity or plurality of conception (number), the terminations of nouns undergo certain modifications of form; in some languages two, in some only one. Thus in English the form *man* expresses one individual, the form *men* two or several; the former is said to be in the *singular*, the latter in the *plural* number; but in some languages a peculiar modification is used to express the conception of two objects, and this is called the *dual* number. To express the relations of conceptions to each other the English language employs prepositions or juxtaposition; but many languages make use of an inflection of the primitive form of the noun; this inflection is called *case*. The number of cases is different in different languages, but is rarely more than six. See CASE.

NOVALIS. See HARDENBERG (FRIEDRICH VON).

NOVARA, a town, Kingdom of Italy, capital of province of same name, beautifully situated between the Agogna and Terdoppia, 53 miles E.N.E. of Turin. It consists of three large squares and several streets, which, though narrow, are well built, and has an ancient and magnificent cathedral with a lofty tower, and several fine sculptures and paintings, an episcopal palace, two colleges, a ruinous old castle, and a remarkably fine market-house. The manufactures are not of much importance, but include a kind of sweet biscuits which have a large sale in many parts of Italy. The rice and grain markets are the most important in Piedmont. Population, according to the census of 1881, 15,232. Novara is famous for the battle fought there on 23d March, 1849, between the Sardinians and Austrians, in which the former were completely defeated, and Charles Albert induced in consequence to abdicate in favour of his son Victor Emmanuel.—The province consists generally of a large and fertile plain, watered by the Po and several of its tributaries, and well adapted for the growth of rice. Pop. 704,233.

NOVA SCOTIA, a province of the Dominion of Canada, consisting of a long narrow peninsula, called Nova Scotia Proper, and the Island of Cape Breton, which is separated from the mainland by the Strait of Canso. It is bounded on the north by Northumberland Strait and the Gulf of St. Lawrence; north-east, south, and south-east by the Atlantic; west by the Bay of Fundy; and north by New Brunswick, with which it is connected by an isthmus only 11 miles broad. Greatest length, from south-west to north-east, 350 miles; greatest breadth, about 120 miles; area, 20,907 square miles, or 13,389,480 acres, one-fifth of which consists of lakes, rivers, and inlets of the sea. Of the whole about 5,000,000 acres are fit for tillage. Its south-eastern coast is remarkable for the number and capacity of its harbours; there being no fewer than twenty-six ports, which can admit the largest vessels, between Halifax and Cape Canso, a distance of not more than 110 miles. There are no mountains of great magnitude or remarkable elevation; ranges of high lands seldom exceeding 500 feet above sea-level run through the country, generally east to west, and with less prominent hills and undulations give a pleasing variety to the scenery. There are few large lakes or rivers; the largest of the former is Lake Rosignol, about 20 miles in length; and of the latter, Shubenacadie, about ½ mile wide at its mouth, draining into Minas Bay; an extensive chain of small lakes, of which nearly 100 occur within a space of 20 miles square.

The minerals are very valuable. Granite, trap, and clay-slate rocks predominate; the most abundant variety is the gray granite, which prevails along the shore, and is well adapted for mill-stones. Clay-slate of fine quality is of extensive formation in the eastern section of the colony, and excellent grind-stones are obtained from a stratum of sandstone, found between the coal and limestone. Coal, with iron in combination, abounds in many places. Gold has also been found in various places. Copper-ore also exists, as also does silver, lead, and tin; and gypsum is plentiful, and furnishes an active and profitable trade. Petroleum has been recently discovered and wells have been sunk in Cape Breton. In a recent year the total value of the mineral productions amounted to £700,000. The soils of Nova Scotia are various along the southern shore; the granite forms the basis, extending in many places for about 20 miles into the interior. This region is the least fertile, but there are elsewhere extensive alluvial tracts producing the most abundant crops. Many fine fertile districts also are met with on the northern coast, along the banks of rivers and the heads of bays. The climate of Nova Scotia is affected by its almost insular position, and is characterized by a remarkable salubrity. The springs are tedious; but the summer heats being for a brief season excessive vegetation is singularly rapid, and the autumn is delightful. In winter there is sometimes sledding, and hard frost for weeks before Christmas; and perhaps in the following year the plough may be seen in the fields as late as the 10th of January. The thermometer ranges from – 20° to 98° in the shade, taking the two extremes. The western counties are 8° or 10° warmer on the average than the eastern, and in some parts the thermometer rarely falls below zero. Wheat, potatoes, and oats are the most important crops; but buckwheat, rye, barley, Indian-corn, and field-pease are extensively cultivated, and in seasons when the wheat and potatoes fail are of great value. Nova Scotia, however, does not yet supply her population with bread even in good seasons, large importations of fine flour being yearly made from the United States. The apple orchards of the western counties are very productive, and extend along the roadside in an unbroken line for 30 miles. Apples and cider are annually exported, and the domestic supply is cheap and abundant. Cattle and sheep are raised in considerable numbers, and are exported both to New Brunswick and Newfoundland; but the breeds are inferior, and little attention is paid to their improvement. The cod and haddock fisheries are actively prosecuted all along the south coast. Mackerel and herrings are also taken in great quantities; but the salmon-fishing has greatly fallen off, from the erection of grist and saw mills on the streams. The total value of fish (chiefly cod) exported from Nova Scotia in the year ending June 30, 1878, was £916,124, not including what was sent to other provinces of the Dominion. Several attempts have been made to prosecute the whale and seal fisheries. The manufactures of Nova Scotia are yet but very limited. Coarse cloths, called 'homespuns,' are made by the peasantry, and are generally worn by that class. Coarse flannels, bed-linen, blankets, and carpets are also manufactured. Tanning is carried on to some extent, and in the towns and villages boots, shoes, saddlery, harness, household furniture, and agricultural implements are made in large quantities. Bonnets of bleached grass and hats of straw are made in many of the rural districts; and in the neighbourhood of Halifax tobacco, confectionery, printing and wrapping paper, hats, and some other articles are manufactured. There are several distilleries there also. Ship-building is extensively engaged in, vessels with an aggregate burden of more than 50,000 tons being built annually. The houses of Nova Scotia are mostly constructed of timber, excepting in Halifax and the larger towns, where some good stone and brick houses are to be seen. Yet stone for building abounds in the province—granite of the finest quality on the south coast; freestone all along the north.

Nova Scotia is favourably situated for commerce. The foreign trade is comparatively large, and will no doubt greatly increase as the natural resources are developed. The imports consist principally of British manufactures; and spirits, sugar, wines, coffee, &c., from our colonies. The principal articles of export are fish, timber, and coal. In 1877–78 the imports from beyond the Dominion were £1,704,323; exports to beyond the Dominion, £1,562,663. There are above 300 miles of railway in operation in the province.

The population of Nova Scotia is now chiefly composed of a native race, sprung directly or indirectly from the three great families of the United Kingdom —English, Irish, and Scotch. The Irish are found in large numbers only in the capital; the Scotch

chiefly in the eastern counties. The western and midland counties are principally occupied by the descendants of the loyalists, whose blood is English. The county of Lunenberg is inhabited by a race sprung from a body of German and Swiss Protestants, who emigrated from Rotterdam in 1753. There are also several settlements of French Acadians. But the descendants of all form but one race, and are known by but one name, the whole living in perfect harmony. The Indians are still a distinct people, but there are only a few hundreds of them left in the province. The religious divisions here are those of the United Kingdom and of North America generally. The five largest religious bodies are Episcopalians, Presbyterians, Roman Catholics, Methodists, and Baptists. Of these the most numerous are the Presbyterians, next the Roman Catholics, then the Baptists, Episcopalians, and Methodists. Education has been pretty widely and equally diffused over the colony. It is free to all classes of the community. The public affairs of the colony are administered by a lieutenant-governor, council, and house of assembly; the last, consisting of thirty-eight members elected every four years, has entire control over the provincial revenue. It sends twelve members to the senate, and eighteen to the house of commons of the Dominion Parliament. The laws are dispensed by a supreme court and district courts as in Canada. The laws in force are the common and the statute law of England, and the statute law of Nova Scotia. The capital of the province is Halifax, which possesses one of the finest harbours in America.

Nova Scotia was first visited by the Cabots in 1497, but was not colonized by Europeans till 1604, when De Monts, a Frenchman, and his followers, and some Jesuits, attempted for eight years to form settlements in Port Royal, St. Croix, &c., but were finally expelled from the country by the English governor and colonists of Virginia, who claimed the country by right of the discovery of the Cabots. In 1621 Sir William Alexander applied for and obtained from James I. a grant of the whole country, which he proposed to colonize on an extensive scale, and in 1623 the attempt was made; but the proposed colonists finding the various points where they wished to establish themselves thronged by foreign adventurers, did not think it prudent to attempt a settlement, and therefore returned to England. During the reign of Charles I. the Nova Scotia baronets were created, and their patents ratified in Parliament; they were to contribute their aid to the settlement, and to have portions of land allotted to them; their number was not to exceed 150. In 1654 Cromwell sent out an armed force, and took possession of the country, which remained with the English till 1667, when it was ceded to France by the Treaty of Breda. But the English from time to time attacked the French colonists at various points, and ravaged their settlements, continuing to harass and annoy them till 1713, when the country was finally ceded to England. In 1763 the island of Cape Breton was annexed to Nova Scotia, and in 1867 the province became a member of the Dominion of Canada. Pop. (1871), 387,800; (1881), 440,572.

NOVATIANS, a sect so called from their founder Novatus or Novatianus, who was a presbyter at Rome in the middle of the third century. Having been excommunicated by Cornelius, bishop of Rome, for not only refusing to submit to his authority, but even claiming his see, he formed a distinct sect, which laid claim to peculiar purity of discipline and conduct, and carried their rigour so far as to maintain that the lapsed, or those who, after professing Christianity, had fallen away, were not to be readmitted into the church, however strong the evidence of their sincere repentance might be, without being re-baptized. This appears to have been his chief heresy, and as he not only possessed learning and eloquence, but led a pious and exemplary life, he attracted numerous followers, who established separate religious communities, and maintained their existence principally in Italy and Africa till the sixth century. They condemned second marriages, and would not associate with any that had contracted them. Novatian wrote several works, of which Jerome gives a catalogue. The tradition among his followers was that he suffered martyrdom.

NOVA ZEMBLA (Russian, *Novaia Zemlia*), two large islands in the Arctic Ocean, belonging to Russia, and forming a dependency of the government of Archangel; lat. 70° 30′ to 77° N.; lon. 52° to 69° E. They are separated from each other by the narrow strait Matotchkin Shar; and from the Isle of Vaigatz on the south by the Strait, and from the mainland on the east by the Sea of Kara; greatest length, north-east to south-west, 635 miles; breadth, 170 miles. The far greater part of the interior is unexplored. The general slope of both islands appears to be towards Matotchkin Strait, on which the mouths of at least fifteen small streams have been counted. Lakes also are numerous. The whole territory is wild and desolate in the extreme. The coasts swarm with seals, various kinds of fish, and vast flights of water-fowl. The interior, which is partly covered with stunted shrubs, short grass, and moss, is frequented by reindeer, white bears, ermines, and Arctic foxes. Nova Zembla has no permanent inhabitants, but is visited by Russian hunters and fishers. In 1596 it was reached by Barentz, who wintered there. It was circumnavigated by Johannesen in 1869 and 1870, and the Kara Sea found comparatively free of ice. It was again circumnavigated by Captain Carlsen in 1871, and partially explored by Lieutenants Weyprecht and Payer in the same year, and again in 1872–74.

NOVEL (Italian, *novella*), a prose narrative of a series of fictitious events connected by a plot, and involving portraitures of character and descriptions of scenery. In its present signification novel seems to express a species of fictitious narrative somewhat different from a romance; yet it would be difficult to assign the exact distinction, and in French, Italian, and German the same name (*roman*, *romanzo*, and *roman*) is used for both species of composition. The term novel is generally applied to narratives of every-day life and manners; romance to a series of adventures of a marvellous kind, and occurring in distant lands and past ages; while the name tale denotes generally a shorter production, which may include probable or improbable events, and is equivalent to the Italian *novella* and *conto*, the German *novelle* and *mährchen*, and the French *conte*. We propose to treat of these various kinds of prose narrative under the present heading.

Romances have existed from the remotest antiquity among the principal oriental nations. In the most ancient literature of the Chinese are to be found parables, marvellous fictitious tales, and epics; and for many centuries they have had novels of social life similar to those of Europe. They only among the Asiatic nations have delineated the phenomena of common life, recounting the conversations, cares, and habits of the household without introducing incidents of a marvellous nature. By their names, as well as characters, the heroes might pass for ordinary inhabitants of Canton or Peking. Their novels abound in detailed descriptions, are remarkable for the beauty of their images and epithets, and are among the best sources of information respecting the life of the people. The romance of the Hindus is

perhaps of equal antiquity, but consists mainly of fantastic and improbable narratives, whose scenes are in the depths of the sea, on craggy peaks, and in the vague realms of space, and whose actors are princes opposed by giants, princesses carried off by genii, unfortunates metamorphosed into animals by the power of talismans, spells, &c. The character of Hindu fiction has led some writers to believe that the Persian and Arabian tales were derived from India, as many of the fables no doubt were. The Arabian tales of the Thousand and One Nights are examples of romantic narrative, highly esteemed in Europe, the recital of which is still more fascinating and general among the people of the East than is the perusal of printed novels among the western public.

The earliest Greek compositions of this nature about which we have any information are the Milesian Tales, attributed to one Aristides. None of these tales are extant, either in the original or in the Latin version, made about the time of Marius and Sulla; but we possess about forty stories by Parthenius Nicæas, which are supposed to be to a certain extent adaptations from them. This collection, entitled Peri Erotikōn Pathēmatōn, is dedicated to Cornelius Gallus, a contemporary and friend of Virgil. The Cyropædia of Xenophon resembles in many respects a historical romance. Clearchus, a disciple of Aristotle, wrote a series of love tales, which have been also lost. Shortly after him came Antonius Diogenes with a romance in twenty-four books, entitled Of the Incredible Things beyond Thule, founded on the loves and adventures of Dinias and Dercyllis. Photius gives an outline of its contents in his Bibliotheca Codicum. An interval of several centuries now elapses before we come upon another Greek writer of fiction. Lucius of Patra, and Lucian, who flourished under Marcus Aurelius, are the first important names we meet with. The works of the former are simply accounts of magical transformations, not properly developed tales; and Lucian merely makes use of his plots as Bayes in the Rehearsal did, to bring in fine things, humorous, satirical, and moral. The first of the new school of romance writers is Iamblichus (not the Neo-Platonist), of whose Babylonika Photius gives a tolerably full epitome. We now come upon the most notable name in Greek prose fiction, that of Heliodorus, bishop of Tricca in Thessaly, who lived about the end of the fourth century. His Æthiopica, or, as it is often called, The Loves of Theagenes and Charicleia, though deficient in those characteristics of modern fiction which appeal to the universal sympathies of our nature, is extremely interesting on account of the rapid succession of strange and not altogether improbable adventures, the many and various characters introduced, and the beautiful scenes described. There can be little doubt but that his style and manner was closely imitated by Achilles Tatius and all the subsequent writers of erotic romance, and there is almost equal certainty that he formed a model to the ponderous historical romance writers of the school of Mademoiselle Scudéri. Next to Heliodorus in point of merit stands Achilles Tatius (flourished about 450–500 A.D.), whose romance in eight books, The Loves of Leucippe and Clitophon, is a mine of marvellous incidents, which has been thoroughly ransacked by various French and Italian authors. The Daphne and Chloe of Longus, who lived about the same epoch, is a pastoral romance containing fine descriptions of scenery on the Island of Lesbos. Prose fiction now rapidly degenerated, and its later and worst specimens in Greek are The Loves of Chæreas and Callirrhoe, by Chariton of Aphrodisias; The Loves of Anthia and Abrocomas, by Xenophon of Ephesus; and The Loves of Hysminias and Hysmine.

Prose fiction had appeared in Latin in the first century after Christ in the comic and obscene Satyricon, attributed to Petronius Arbiter, the minion of Nero; and in the second century the Golden Ass of Appuleius made its appearance. Most of these classical romances relate the adventures of lovers carried off by pirates or otherwise separated, witnessing rites of magic and religion, secret orgies, and infamous revelries in the cities of the Mediterranean shores, and at last reunited by extraordinary coincidences. Unlike the modern novel, they were neither so numerous nor so highly reputed as to form an important part of the literature. There yet remains to be mentioned one work which belongs to this period, but which is totally different in character and style, namely, the ecclesiastical romance of Barlaam and Josaphat, attributed, without good reason, however, to St. John of Damascus. It narrates the conversion of an Indian prince, Josaphat, by the hermit Barlaam, and was composed for the express purpose of recommending the ascetic and recluse mode of Christian life. This work has been translated into most of the European languages.

The first mediæval romances of Western Europe were metrical. Whether their materials and spirit were derived from Scandinavian and Teutonic sources, especially through the Normans, or from the East through the Spanish Moors and Crusaders, or whether they were products of the ancient Celtic genius, are questions not yet definitely settled. It is certain that they were cultivated by the troubadours of Provence and the trouvères of Normandy from the eleventh century. The wandering minstrels invented, translated, and amplified stories in order to satisfy the craving for the marvellous prevalent in the hut and in the castle, rehearsing known facts and genealogies, transforming chronicles and legends into romances of chivalry, in which Alexander the Great figures as a knight-errant, and Virgil as a mighty magician; adapting Byzantine tales, and devising humorous and scandalous stories of real life. The romances of chivalry introduced knights whose deeds, courage, and sentiments of honour and delicacy were praised in the most extravagant manner. The transformation of metrical into prose romance was partly owing to the invention of the art of printing, the advantage of metre for purposes of recital being thus superseded, and partly to the evolution of prose forms out of metrical beginnings, as had taken place in the history of classical literature. Prose narratives celebrated Arthur, Charlemagne, Amadis de Gaul, and other heroes of chivalry, and were as wearisome and naïve as their predecessors, though composed with more regard to probability, and to some extent depicting manners instead of being mere rhapsodies of fierce encounters. The principal romances of the Arthurian cycle, which is in its essence of Welsh and Armorican origin, are those of Merlin the Enchanter, of Arthur, of the Holy Graal, of Percival, of Lancelot of the Lake, of Tristan, &c. They relate the exploits and loves of the Knights of the Round Table; the scenes are generally laid in Wales, Cornwall, Brittany, Ireland, or Scotland; only in one or two of the series are we transferred to Egypt or India. The group connected with Charlemagne and his Paladins are of French origin. They appear to be founded for the most part on a legendary metrical chronicle entitled Historia de Vita Caroli Magni et Rolandi, which has been attributed to Archbishop Turpin or Tilpin of Rheims, a contemporary of Charlemagne, but which was probably a product of the eleventh or twelfth century; after this came a series of metrical romances, strictly so termed, out of which was developed the prose counterparts. The principal are Huon of Bordeaux, which supplied Wieland with

material for his Oberon; Guerin de Montglave, Gaylen Rhetoré, Doolin de Mayence, Miles et Ames, Ogier le Danois, &c. In these romances the scenes are often laid in Africa, Palestine, Bagdad, Constantinople, India, &c., and the actors are Christian knights and Mohammedan maidens of dazzling beauty; Saracen princes, sultans, and emirs; fairies, apes, dervishes, demons; all the glitter of oriental life, gilded domes, splendid jewels, talismans, gorgeous dresses—everything, in short, that could illustrate the glowing scenery, the brilliant life, and the fanciful superstitions of eastern lands, is lavishly introduced. It cannot be decided with any degree of certainty to what people we are indebted for the Amadis de Gaul cycle; it has been claimed for the Portuguese, Spanish, and French. It belongs to a later date than the Arthurian and Charlemagne cycles; many of the scenes are laid at Constantinople. Notwithstanding the opposition all these wild and improbable tales of chivalry met with, they did not sink into disrepute until the customs of chivalry had become obsolete and its literature was thrown into ridicule and contempt by Cervantes.

Scandinavia abounded in legendary romances, both metrical and prose, on national subjects, as the Völsunga Saga, the Wilkina Saga, Frithiof's Saga, the Saga of King Ragnar Lodbrok, and others, all having a bold, vigorous, gloomy character peculiar to themselves. Germany also had a peculiar cycle of heroes derived from her traditional history as heir of the Roman Empire, such as Siegfried, Theodoric, king of the Goths (Dietrich of Bern), Attila (Etzel), king of the Huns, Günther, king of Burgundy, &c. The German romances are of a more fierce and unrefined character than the French, from which they differ too in employing the preternatural arts of the subterranean Duergar or dwarfs. The Italians originated no romances of the kind described above. They adopted from the French the tales of Charlemagne and his paladins, which, however, attracted little attention till Boiardo, Berni, Pulci, and Ariosto made them the groundwork of poems that were diffuse and rambling in style, but far superior in regularity and beauty of diction to the earlier romances. These romances had been known in France two centuries before they were introduced into Italy. The French Contes and Fabliaux, facetious tales of real life, found more favour in Italy, whose political features during the middle ages were mercantile and lettered republics instead of feudal chivalric institutions. The first work of this sort is the Cento Novelle Antiche, otherwise called Il Novellino. It is a collection of stories current among the Italian people, or taken from the Fabliaux, the Gesta Romanorum, and some of the more graceful episodes in the chivalric romances, and was executed by unknown authors about the end of the thirteenth century. It was followed by the Decameron of Boccaccio (1358), which is a collection of 100 tales drawn from all sources, and transcribed in a charming style, but are for the most part too indelicate to suit modern taste. Their success was immense, and brought into the field a host of imitators, among whom we can only mention Sacchetti, Ser Giovanni (to whom Chaucer, Shakspere, and Molière are indebted), Massuccio di Salerno, Agnolo Firenzuolo, Luigi da Porta, Cinthio (from whose works Shakspere and his contemporaries largely drew), Grazzini, Straparolo, Bandello (in whom we find the original of Massinger's Picture and Shakspere's Twelfth Night), Malespini, Campeggi, and others. In the fifteenth century the romances of chivalry had run their course in France, but the tales of love intrigue continued. The principal of these are the Cent Nouvelles and the Heptameron of Margaret of Navarre. A totally different class of fiction popular in this era deserves a word in passing, the spiritual romances. The greatest mediæval work of this character is unquestionably the Golden Legend of Voragine, consisting of 177 sections, each devoted to a particular saint or festival. Besides this there was a species of spiritual tales, the Contes Dévots, written by the monks themselves, probably with the intention of counteracting the influence of the licentious stories of the troubadours, but exhibiting a by no means lofty morality among the ecclesiastics, or pure conceptions of so revered a personage as the Virgin, who is occasionally represented as little better than a procuress.

During the sixteenth and seventeenth centuries the romance writers began to alter and extend their sphere. The power of the church had been rudely shaken, the institutions of feudalism were crumbling into decay, and the uniformity which reigned to a great extent in the former modes of life and thought were rapidly disappearing, and a tendency to the other extreme of individualism is clearly discernible. Those writers who had no faith in the possibility or efficacy of ecclesiastical or political reform, and who had not been too sorely crushed by the evils of the time, vented their wit and satire on the debaucheries of the clergy and the duplicity of politicians and courtiers. When this was woven into a narrative the result was the comic romance, which is first worthily represented by the Garagantua and Pantagruel of Rabelais, the father of ridicule. Next in point of date comes the Vita di Bertoldo of Julio Cesare Croce, a narrative of the humorous and successful exploits of a clever but ugly peasant, and regarding which we are told that it was as popular for two centuries in Italy as Robinson Crusoe was in England. Some years after appeared the Don Quixote of Cervantes, which was a death-blow to the exaggerated interminable chivalric romance. About the same time the first of the *picaresque* romances was given to the Spanish public. It was written by Matteo Aleman, and entitled The Life of Guzman Alfarache; the hero is successively beggar, swindler, pander, student, and galley-slave. It gave birth to a host of Spanish romances with beggars and scamps as the central figures, and is said to have suggested to Le Sage the idea of Gil Blas. The best German representatives of the comic romance are Till Eulenspiegel and Simplicissimus. The pastoral romance, introduced into Italy in the Arcadia of Sannazzaro about the end of the fifteenth century, had been previously much cultivated by the Portuguese, and was naturalized half a century later in Spain by Montemayor, whose Diana was succeeded by a host of imitators. Shakspere obtained from this work the plot of the Two Gentlemen of Verona, and some of the most diverting scenes of the Midsummer Night's Dream. The Arcadia of Sir Philip Sydney blends pastoral with chivalrous manners, is remarkable for its ideality, and marks the transition to the romances of conventional love and metaphysical gallantry, tedious from their length and insipidity, a prominent example of which is the Astrée of Honoré D'Urfé. The prevalent striving after increased dignity and artifice of style appears in its extreme in the Euphues of Lilly. From this species must be distinguished the dreary historical romance, represented by the works of Gomberville, Calprenède, and Mademoiselle de Scudéri, which were highly esteemed in France during the seventeenth century, but are now looked upon as literary monstrosities. In them were combined modern ideas of courage, courtesy, and fidelity, with stories of the ancient Greeks, Egyptians, Babylonians, and Persians, in prolix works of many volumes each. They were driven from the field of literature by the ridicule heaped on them by Molière and Boileau. The coun-

terpart to these long-winded romances was furnished by the Roman Comique of Scarron, which detailed a long series of adventures as low as those of the other class were elevated. Politico-philosophical subjects were frequently tricked out in the graceful dress of fiction, the most notable examples being More's Utopia, Barclay's Argenis, and Fénelon's Télémaque. Thus early in the seventeenth century prose fiction in most of its leading types, as the novelette of gallantry, the romance of enchantment and chivalry, the pastoral tale, the bold riotous satire, the picaresque or vagabond, and the philosophical novel had become an established form of literature in the principal languages of Europe.

The more complete development of the English novel is almost contemporaneous with the decline of the tragic drama. As the more violent passions and impulses of society gradually became restrained, the narrative style was called into play to give a more even and detailed development of sentiment and incident than is possible in the drama. The first name of note we meet with is that of Mrs. Aphra Behn (the Astræa of the Dunciad), whose tales are as licentious as the plays of the contemporary dramatists, as also are those of her successors and imitators Mrs. Heywood and Mrs. Manley. The only fictions of the time evincing high poetic talent are Bunyan's allegories, the Pilgrim's Progress and the Holy War. The modern English novel may be said to date from Defoe. The effect of his Robinson Crusoe, Colonel Jack, Moll Flanders, &c., is caused by the delineation and skilful combination of practical details, which give to the adventures the force of realities commanding the interest and sympathy of the observer. The satirist of the age was Swift, the English Rabelais, whose Gulliver's Travels are equally interesting whether read with or without reference to the satire lurking beneath the surface. The novel of everyday life was further improved by Richardson, Fielding, and Smollett. Though the productions of Richardson are of great length, yet their accumulation of delicate light and shade, the knowledge of human sentiments and passions they display, and the earnestness with which they enlisted the passions on the side of virtue, made them a great advance on their predecessors. The novels of Fielding have a less sentimental tendency, are marked by less delicacy of perception and command of pathos, and more by a flow of wild animal spirits, vivacity of manner, grasp of character, and thorough knowledge of all sections of English life. Unlike Fielding, Smollett seized upon the eccentric rather than the common features of character, dealing in humorous exaggeration, grouping together burlesque personages, incidents, and oddities of speech and action. His humour belongs more to farce than to genuine comedy. The Tristram Shandy of Sterne displays a phase of humour differing from that of his contemporaries, than which it must be admitted to be deeper and finer in quality. Tristram Shandy has little plot or continuous action, its interest depending on its characters and sentiments; it abounds in happy phrases, keen glances into the depths of human character, and in pathos which is occasionally closely allied to mawkishness. Four years after this work appeared Goldsmith's Vicar of Wakefield, which possesses a higher moral tone than any that had preceded it. From this time till the beginning of the present century no work of fiction of the highest rank appeared. Among the best of those of secondary rank may be mentioned Johnson's Rasselas, Walpole's Castle of Otranto, Clara Reeve's Old English Baron, Mackenzie's Man of Feeling, Madame D'Arblay's Evelina, and Beckford's Vathek. About this time were issued and greedily devoured by both sexes in even the higher ranks of life the trash known as the Minerva Press Novels, whose heroes, to quote Charles Lamb, belonged neither to this world nor any conceivable one; a string of activities without purpose, of purposes without a motive. Ranking higher than these are the novels of horrors, represented by the Mysteries of Udolpho and others by Mrs. Radcliffe, M. G. Lewis's Monk, and Maturin's Montorio. By these works the imagination was fed with the terrors bred by wild nightly adventures in ruined castles with wild banditti and dreadful spectres. A return to stricter realism was manifested by Miss Edgeworth and Miss Austen, who described domestic life with minuteness, good sense, a clear moral aim, and charming simplicity of style. During the era of the French revolution a tendency to embody social speculations and aspirations, and to discuss matters connected with religion, appeared, especially in the novels of Bage, Holcroft, and Godwin. Such was the condition of British novel writing when the century closed. We can give but a hurried glance at the French and German literature of fiction. In France the historical novel was widely cultivated, but without great success, no book specially worthy of notice being produced during the century. Among the novels treating of social life the most prominent are the Vie de Mariamne and the Paysan Parvenu of Marivaux, Manon l'Escaut, by the Abbé Prévot, who may be considered as the forerunner of the meretricious demi-monde school so well represented in our own time by the younger Dumas; the Julie, the Nouvelle Héloise, and the Émile of Rousseau, containing the author's theories of love, education, religion, and society. In the department of humorous and satirical fiction the palm belongs to Le Sage, author of Gil Blas, the Diable Boiteux, and the Bachelier de Salamanque. The novels of the younger Crébillon are more remarkable for their licentiousness than for their humour or satire. As a satirist Voltaire is entitled to high rank; his Candide, Zadig, Princesse de Babylone, &c., attack in a covert manner superstition and despotism under the forms most familiar to the writer; many of his incidents are borrowed from older authors. In oriental and fairy tales French literature is particularly rich. The translation of the Arabian Nights' Entertainments by Galland (1704–17), the publication of the Bibliothèque Orientale by D'Herbelot, and of a great number of Arabian and Persian books, created a taste for the exaggerations of eastern fiction, and brought a variety of works into the field teeming with genii, magicians, califs, sultans, princesses, eunuchs, slaves, &c. The most important of these are the Contes Tartares, the Mille et un Quart d'Heure, the Contes Chinois, Contes Mongols, &c. Among the writers of fairy tales we may mention Charles Perrault, whose Contes du Temps Passé include many a tale dear to childhood—the Sleeping Beauty, Blue Beard, Puss in Boots, Little Red Riding Hood, &c. The principal successors of Perrault were the Comtesse d'Aunoy, Mademoiselle de la Force, Madame Murat, and Madame Villeneuve. Of the class of fictions rendered popular by Robinson Crusoe, and known as Imaginary Voyages and Travels, the most successful were the Histoire Comique des Estats et Empires de la Lune, and the Estats et Empires du Soleil, by Bergerac, from which Swift largely borrowed for his Gulliver. The Paul et Virginie of Bernardin de St. Pierre, which belongs to none of the above classes, must not be forgotten. It was not until late in the century that German writers of fiction rose into European fame. Three great names tower above all others—Wieland, whose Greek romances, Agathon, Aristippus, Socrates, &c., are of that didactic and sceptical character then so characteristic of the reflective genius of the Continent;

Jean Paul Richter, whose works abound in strokes of humour, pathos, and fancy; and Goethe, whose novels are attempts to represent or solve the great facts and problems of life and destiny. Popular legendary tales (Volksmährchen) constitute a special department of German literature, which was successfully cultivated by Ludwig Tieck, De la Motte Fouqué, Chamisso, Clemens Brentano, Achim von Arnim, Zschokke, Hoffman, and others, who treated the traditional groundwork with earnestness and apparent belief, while Musäus employed it only for purposes of drollery, or of fanciful or grotesque description. Chivalric romance was revived by Cramer, Spiess, Schlenkert, and Weit Weber. August Lafontaine succeeded in sentimental descriptions of domestic life; and Wetzel, Müller, Schulz, and Hippel illustrated the comic side of family trials and joys.

In entering upon the present century the first name we meet with is that of the author of Waverley. Sir Walter Scott may be said to have created the historical romance as a new department of English literature. His retrospective cast of mind, genial sympathies, antiquarian research, and creative imagination enabled him to give a vivid, if not always a truthful, reproduction of past characters, manners, thoughts, and passions. He raised a higher standard of novel writing than had been before known, and substituted for the mawkish sentimentalism and ridiculous extravagance which had been long popular, good sense, genuine feeling, power and beauty of description, and life-like impersonations of manly and womanly character in all ranks from the cottage to the throne. Since his day the British novelists are the most numerous class in the list of authors; and we can but mention a few of the more prominent names from that time till the present day. In the novel of Scotch life and manners we meet with Galt, Professor Wilson, Hogg, Moir, George Macdonald, &c.; in the Irish novel Lady Morgan, Banim, Crofton Croker, Carleton, Lover, Lever, Mrs. S. C. Hall, &c.; in the novel of English life and manners, Mrs. Gore, Theodore Hook, the sisters Brontë, Anthony Trollope, Mrs. Craik, together with the still greater names of Disraeli, Lord Lytton, George Eliot (Miss Evans), Dickens, and Thackeray; in the historical novel, G. P. R. James, Ainsworth, Lytton, Kingsley, &c.; in the nautical novel, Marryatt, Chamier, Hannay, and Cupples; in the criminal novel, Ainsworth, with whom we may associate the equally notorious names of the sensational novelists Wilkie Collins, Miss Braddon, and others. Other writers worthy of mention are Mrs. Oliphant, Miss Yonge, Thomas Hughes, George Lewes, Charles Reade, William Black, and Miss Thackeray. In American literature novels appeared later than histories and poems. It was not till after the revolution that the earliest attempts in prose fiction were made. The first notable adventurer in this field was Charles Brockden Brown, who was followed by J. Fenimore Cooper, Edgar A. Poe, Washington Irving, Nathaniel Hawthorne, Harriet Beecher Stowe, and Oliver Wendell Holmes, in all of whose writings (those of Poe alone excepted) the influence of the life, traditions, scenery, and other salient characteristics of the New World is apparent. The most celebrated of the French novelists of the present century are Madame de Staël, Châteaubriand, Victor Hugo, Dumas (father and son), Balzac, Paul de Kock, Alphonse Karr, Georges Sand (Madame Dudevant), Feydeau, Feuillet, Prosper Mérimée, Edmond About, Erckmann-Chatrian, &c. The more noteworthy names in the German literature of fiction are those of Gutzkow, Wilibald Alexis (Wilhelm Häring), Hackländer, Spielhagen, Gottfried and Johanna Kinkel, Auerbach, Rodenberg, G. zu Putlitz, Gustav Freytag, Paul Heyse, and others. Among the most important novels in other languages are those in the Italian by Manzoni, in Danish by Hans Christian Andersen, in Swedish by Frederika Bremer and Madame Carlen, in Hungarian by Maurice Jokái, and in Russian by Ivan Tourgueneff. See Dunlop, History of Fiction (third edition, London, 1843); Wolff, Allgemeine Geschichte des Romans (second edition, Jena, 1850); Masson, British Novelists and their Styles (London, 1859).

NOVELS (Latin, *Novellæ Constitutiones*, new constitutions), in law, are those decrees of the Greek emperors which appeared after the official collection, in the Codex repetitæ Prælectionis, since the year 534 A.D. Of Justinian 160 are known, of which but ninety-seven have the force of law, because these only were commented upon by the first commentators of the Roman law. The novels of the Emperor Leo have no authority.

NOVEMBER (from *novem*, nine), the eleventh month of our year and the ninth month of the Roman year when it consisted of ten months. By our pagan ancestors it was called *Blot-monath*, blood month, on account of the general slaughter of cattle at this time of the year for winter provisions.

NOVGOROD, a government of Russia, bounded on the N. by the government of Olonetz, on the N.W. and W. by St. Petersburg, on the S.W. and S. by Pskov, on the S. by Tver, on the S.E. by Jaroslav, and on the E. by Vologda; area, 46,297 square miles. It is generally flat, a considerable portion of it, particularly in the west and north-east, being covered with lakes and marshes. In the south-west the Valdai Hills enter from the government of Pskov, and stretch north-east. Though they nowhere attain a height exceeding 1000 feet, they have a much greater apparent elevation from the general flatness of the surrounding country. They form the principal water-shed, separating the basin of the Baltic from that of the Volga. To their basins the whole of the government belongs, with exception of a small portion of the north-east. The lakes are numerous, and three of them of great extent—Vosje, Bielo-Ossero, and Ilmen. The climate is somewhat more severe than that of St. Petersburg. A great part of the surface is covered by forests, chiefly of pine, beech, and birch. The principal crops are rye, barley, and oats. Flax and hemp are raised in considerable quantities. The lakes and rivers are well supplied with fish, which form a considerable article of export, particularly to St. Petersburg and Moscow. Both manufactures and trade are unimportant. Pop. 1,390,017.

NOVGOROD, or VELIKI-NOVGOROD (*Great Novgorod*), a town of Russia, capital of the above government, on the Volkhov, near the point where it issues from Lake Ilmen, 103 miles S.S.E. St. Petersburg. It stands in a plain, and is divided by the river into two parts, which communicate by a handsome wooden bridge, supported by pillars of granite. The portion of the town on the left bank is surrounded by an earthen rampart, and contains in its centre the Kreml, or citadel. Within it is the cathedral of St. Sophia, built after the model of St. Sophia at Constantinople; besides which there are numerous churches and several monasteries. The manufactures are of little importance, and consist of sail-cloth, leather, tobacco, candles, and vinegar. The trade in corn, flax, and hemp, carried on chiefly with the capital, is considerable. Novgorod was in early times the capital of an independent state, and had a magnitude which justified its surname of Veliki. Its population is said to have once amounted to 400,000, and it carried on an extensive trade. So great was its power and wealth that it excited the jealousy of the Muscovite princes, and in 1477 the Czar Ivan III. nearly destroyed the city, bereft it of its liberties, and ban-

ished its most influential citizens. On the opening of Archangel to English traders, but more especially after the founding of St. Petersburg, the town rapidly declined. Pop. 21,039.

NOVI, a town of Italy, in the province of Alessandria, capital of the district of same name, on the north side of the Apennines, 24 miles N.N.W. of Genoa. It is surrounded by an ancient wall. The manufactures consist of cotton and mixed goods, bombazine, and earthenware, and there are numerous silk-mills, Novi being perhaps the most important silk mart in the kingdom. Pop. 8553.

NOVI-BAZAR, a town of European Turkey, and formerly in the province of Bosnia, situated on the Rashka, a tributary of the Morava, 130 miles south-east of Bosna-Serai. It has important fairs and great wealth. There are no public buildings worthy of notice except the ruined citadel; the houses are generally built of mud. There are warm mineral springs in the vicinity. It is the chief point of communication between Bosnia and Turkey; several of the chief roads of the country cross each other here. When Austria was allowed by the terms of the treaty of Berlin of July, 1878, to occupy Bosnia, the liva or district of Novi-Bazar was excepted from the occupation and still maintained under Turkish administration. Pop. 15,000.

NOVICE and NOVITIATE. A *novice* is a candidate of either sex for a religious order; and *novitiate* is the time in which the novice makes trial of a monastic life before taking the final vows. The Catholic Church has always prescribed strict rules for the trial of novices, and the Council of Trent charges the bishops to watch over the execution of these rules. The novitiate is generally very severe. The novice has to learn the regulations of the order, and generally to perform likewise many menial offices about the convent, and to give account of the most trifling actions to the master or mistress of the novices. The age of profession is fixed by the Council of Trent at sixteen years.

NOVOTCHERKASK. See CHERKASK.

NOYADES (French, *noyer*, to drown), the name given to the execution of political offenders by drowning them, practised during the French revolution, especially by Carrier at Nantes. The method adopted was crowding the victims into a boat, withdrawing a plug in the bottom, and casting them adrift.

NOYAU, a cordial. The word is French, and the term is derived from the use of the kernels of apricots, nectarines, and peaches in flavouring it. The use of them in too large quantities has sometimes made the liquor poisonous, as prussic acid may be extracted from them. The other ingredients in the liquor are French brandy, prunes, celery, bitter almonds, a little essence of orange-peel, and essence of lemon-peel, and rose-water. It is used like the other liqueurs. See LIQUEUR.

NOYON, a town of France, in the department of Oise, on the Vorse, 44 miles E.N.E. of Beauvais. It is a very ancient, but regularly and well-built town, adorned by numerous fountains; and has a cathedral, a fine Romanesque edifice, begun in the twelfth, and completed on a uniform plan early in the thirteenth century; an ancient hôtel de ville; manufactures of sugar, leather, and tissues of hemp and flax; and a trade, chiefly in corn, sent to Paris from a small harbour on the Oise, at Pont L'Évêque. Noyon was the birth-place of John Calvin. Pop. (1881), 6252.

NUBECULÆ. See MAGELLANIC CLOUDS.

NUBIA, a name given, in a more or less restricted sense, to the countries on and around the Valley of the Nile, above Egypt, up as far as Abyssinia. It is very commonly applied to all the countries in the south subjugated by the Turco-Egyptians. Nubia, in this sense, therefore, comprehends:—1, Nubia proper, or the Valley of the Nile extending from the limits of Egypt to the southern bounds of Dongola; 2, the ancient Meroe, the modern capital of which is Shendy, and the domain of which may be considered as extending along the Nile from Dongola to the confluence of the Blue and White rivers; 3, Sennaar, higher up, to which seems to be annexed Kordofan on the west. Nubia proper extends through 6° of latitude, from Philæ (24°) to the southern limit of Dongola (18°), nearly 600 miles along the river. The first portion of it, the Wadi-el-Kunúz, reaches up about 70 miles; then follows Wadi-Nubah, to the second cataract. The average width of this part of the valley does not exceed 4 or 5 miles. It presents to view a glaring, reddish desert, studded with pointed black rocks, and with narrow strips of green and palm-trees along the river. Above the second or great cataract of Wadi-Halfah, which is, in fact, a succession of distinct falls, the Batn-el-Hajár (or Glen of Rocks) reaches up about 50 miles. Here there is scarcely a trace of vegetation. To this follows Sukkot, where the valley opens, and repulsive sterility begins to disappear. The date here attains perfection. Mahas succeeds, and then comes the fertile level of Dongola, where the river forms several large islands; that of Argo being 30 miles in length. The products are numerous, comprising maize, durra, dates, tamarinds, gums, aloes, senna, cotton; and black wool, elephant and rhinoceros hides, ivory, ostrich feathers, ebony, gold-dust, saltpetre, salt, and tobacco are important articles of commerce. Remains of ancient edifices occur throughout the whole extent, but chiefly below Dongola. The most remarkable are the temple of Kelabshi (anciently *Tafa* or *Taphis*), the sculptures of which represent the expedition of Sesostris; that of Dakka (the ancient *Pselcis*); the excavated temple of Ipsamboul, built by Rameses II., a little below Wadi-Halfah; and the temple of Semne, a little above it. In Dongola some colossal figures of granite lie prostrate in the isle of Argo. The inhabitants throughout speak, in various dialects, a language fundamentally the same, and which radically agrees with that of Koldagi, in Kordofan. They are a handsome race, of dark-brown complexion, bold, frank, cheerful, and more simple and incorrupt in manners than their neighbours either up or down the river. In Egypt, where they are called Beráber (Berbers), they are preferred as porters and domestic servants. A great transit trade is carried on between Egypt and the interior of Africa by the Nubians. The chief town of Lower Nubia is Derri, a large village of 200 huts. The new capital, Dongola or Maraka, contains 5000 or 6000 inhabitants. The chief town in Sennaar is Khartoom (which see). The whole population of Nubia is estimated at 1,000,000. Previous to 1822 the Nubians were governed by their own chiefs, maks or malechs, but at that date they were subdued by Ismael Pasha, and the civil government is now administered by Egypt. See SENNAAR and SHENDY.

NUCHA, or NUKHA, a town of Asiatic Russia, 120 miles E.S.E. from Tiflis, situated at the southern base of the Caucasus, in the valley of the Kish-Tshai, an affluent of the Alasani, which is a branch of the Kur. It is divided into two parts, inhabited respectively by Tartars and Armenians; the former form by far the largest portion of the inhabitants. The town is surrounded by mulberry groves and fruit-trees, extending to a distance of 5 or 6 miles. It has long been famous for the rearing of silkworms, silk-spinning, and the manufacture of silk goods. Pop. 24,994.

NUCLEOBRANCHIATA, a term used synonymously with *Heteropoda* to denote an order of the class of Gasteropodous Mollusca. This order is re-

presented by the *Carinaria*, *Atalanta*, *Firola*, &c., and is distinguished by the free-swimming habits of its included members; by the flattened vertically-compressed condition in which the 'foot' exists; and by the presence or absence of a shell. The gills or branchiæ may be distinctly developed, or may be wanting altogether; breathing, in the latter case, being performed by the walls of the mantle or pallial cavity. Locomotion is performed by the ventral fin-like foot, or by the fin-like tail; whilst they may attach themselves to fixed objects by a sucker-like structure situated on the fin. (See GASTEROPODA and MOLLUSCA.)

NUCLEUS, NUCLEOLUS, the name applied to the solid central particle generally found in the cells or structural elements of the animal and plant body. The nucleus, or 'germinal centre,' is viewed by some physiologists as the active reproductive part of the cell, and as that through which the process of cell-multiplication is chiefly carried on. In the lower animals (for example, Protozoa), in which the body consists simply of a little mass of protoplasmic matter, a nucleus is generally found; and such animals, each representing in itself the essential structure of a single cell, appear to reproduce themselves, after one fashion at least, through changes and actions involving the nucleus. The *nucleolus* is the little particle generally seen to be contained in turn within the nucleus. The name *cytoblast* has sometimes been applied to the nucleus. More than one nucleus may be developed within a single cell; and those cells or structures which thus possess nuclei are said to be *nucleated*. The nucleus is not affected by acetic acid, the effect of this reagent being simply to define its outlines more clearly. The nucleus also is that portion of the cell or living structural element which receives the stain given by an ammoniacal solution of carmine, and hence its ready recognition when treated in this fashion. Occasionally nuclei may exist by themselves, and independently of any investing or cell-structures. In certain nervous tissues free nuclei are thus found, and in some fluids and secretions the nuclei may exist without investing parts. The red-corpuscles of human blood may in this way be regarded as free nuclei, derived from the partial dissolution of the white or colourless corpuscles. In other instances, as, for example, in the involuntary muscular fibres, the nuclei may exist on the surface of the fibres; or, as in cellular tissue which is in process of formation, the nuclei may lie amidst a structureless plasma or matrix, without definite boundary structures. Whilst the nuclei generally propagate cells, or are active agents in cell-reproduction, they may of themselves and directly develop to form structures or filaments. Thus by the elongation and union of nuclei the filaments of the arterial coats are formed; and the corpuscles of connective tissue are by some authorities believed to be nuclei, which are connected through ramifications and branches of their substance.

NUCLEUS THEORY. Laurent devised a theory according to which the greater number of organic chemical compounds—that is, compounds of carbon, might be classified. This theory, which is adopted by Gmelin in his renowned Handbook of Chemistry, represents certain hydrocarbons as nuclei, around which are clustered other atoms or groups of atoms, so as to form acids, ethers, alcohols, and so on.

The primary nuclei of Laurent are those hydrocarbons which contain even numbers of carbon and hydrogen atoms, such as ethylene (C_2H_4), benzene (C_6H_6), &c. These primary nuclei yield, by substitution of oxygen, chlorine, &c., a series of secondary nuclei, such as C_6H_5Cl, C_6H_4O, &c.; and these again combine with other groups, such as hydroxyl (HO), amidogen (NH_2), &c.

This system of classification is essentially artificial; it does not bring out the close relations which often exist between bodies placed far apart from one another. At the present day it is very seldom, if ever, employed by chemists.

NUDIBRANCHIATA, a division of 'Naked-gilled' Molluscs, forming a sub-order of the order Opisthobranchiate group, which is in turn a subdivision of the class of Gasteropods. The Opisthobranchiates include those Gasteropods in which the shell is of rudimentary nature, or may be absent altogether. The gills are uncovered, and situated on the back or sides of the body and towards its hinder extremity—hence the name *Opisthobranchiate* (Greek, *opisthen*, behind; *bragchia*, gills). In the Nudibranchiate section of the group no shell exists, save in the young or embryo; and the gills are completely exposed, existing for the most part as branched or arborescent structures. Of Nudibranchiate Molluscs the most familiar examples are the *Doridæ*, or 'Sea-Lemons;' the *Tritoniadæ*, the *Œolidæ*, and the *Elysiadæ*. The group comprises those Gasteropods familiarly designated 'Sea-slugs;' and the general structure of these forms evinces a high degree of perfection.

NUISANCE, a legal term used to denote whatever is a serious annoyance to one's neighbours, or in a general sense to the public at large, in the exercise of their rights of property. Nuisances are of two kinds—*public* or *common*, and *private*. Public nuisances are: Annoyances in the highways, bridges, and public rivers, by rendering the same difficult or dangerous to pass, either by actual obstructions or by want of repair; injurious and offensive trades and manufactures, which, when hurtful to individuals, are actionable, and, when detrimental to public health or convenience, punishable by public prosecution, and subject to fine according to the nature of the offence; keeping hogs in a city or market town; disorderly inns or alehouses, unlicensed stage-plays, booths or stages for rope-dances, mountebanks, and such like, gaming-houses, brothels; all lotteries; making and selling fireworks in unlicensed places, selling them to persons apparently under sixteen years of age, throwing them on any street; eavesdroppers and common scolds. As the proximity of large quantities of gunpowder keeps people in fear for their lives, by 23 and 24 Vict. cap. cxxxix. dealers in gunpowder or manufacturers are prohibited, except in rare cases, from keeping above 200 lbs. of gunpowder; those who are not dealers or manufacturers may not keep above 50 lbs. Not more than thirty barrels by land, or 500 by water, are to be conveyed at one time. Suffering any mischievous dog to go loose, to the danger of neighbours or passengers, is an indictable offence, and an action for damages will also lie against the owner; but it will not lie unless the owner has had notice of the dog having bitten somebody at least once before. In general, the owner of any vicious animal seems bound to secure it at all events, and is liable for damages to a party subsequently injured if the mode he has adopted to secure it proves to be insufficient. A private nuisance may be defined as an injury or annoyance to the person or property of an individual. If a person builds a house so near to that of his neighbour that the roof of the new building overhangs that of the other, and throws the water on it, this is a private nuisance, for which an action will lie. And if a house is built so near that it will obstruct the light and windows of another, the owner of the new house subjects himself to an action. But depriving one of a mere matter of pleasure—as of a fine prospect, this, as it abridges nothing really necessary or convenient, is not an injury for which there is legal remedy. To keep hogs

near one's house, or to carry on any offensive trade —as a tanner, tallow-melter, soap-boiler, or the like —are all nuisances for which an individual has remedy by action. So also is it a nuisance if life be made uncomfortable by the apprehension of danger, as by keeping large quantities of gunpowder or other explosive substances near dwelling-houses, or by employing a steam-engine, which produces a continual noise and vibration in the apartments of a neighbour. By 35 and 36 Vict. cap. lxi. (1872) it is provided that no person shall use a steam-whistle or steam-trumpet to summon or dismiss workmen without the sanction of the authority for the time being empowered to execute the Nuisance Removal Acts, under a penalty of £5, and a fine of 40*s.* for each day during which the offence continues. It is a nuisance to erect a smelting-house for lead so near the land of another that the vapour injures his corn or grass; also to stop or divert water that runs to another's meadow or mill; to corrupt or poison a water-course; to erect a dye-house or lime-pit in the upper part of a stream; to erect a ferry on a river so near another ancient ferry as to draw away its custom, for where there is a ferry by prescription the owner is bound to keep it always in readiness, with expert men and reasonable toll. But where there is no prescriptive right there can be no exclusive privilege; so it is no nuisance to erect a mill so near another as to draw away its custom, nor to set up any trade or school in a neighbourhood in rivalship with another, for by such competition the public is supposed to be benefited. Besides the remedy by action, injured parties may, in a clear case, take the law into their own hands, and remove or abate the nuisance, but it is never advisable to take this course. As regards the power for the removal of public and private nuisances, a statute was passed in 1855 for England, called the Nuisances Removal Act, which has been amended by subsequent acts. By these acts authority is given to some local board, local officers, or overseers of the parish, to carry out the provisions of the act. The local authority is to appoint a sanitary inspector, who may be empowered, on reasonable complaint, to demand an entrance into any private premises so as to inspect their condition, and may order the removal of the nuisance. If the offender refuse to do so the local board may remove the nuisance at his expense, and sue him for such expenses. If any candle-manufactory, soap-house, slaughter-house, or place for boiling offal, blood, bones, &c., be certified by the medical officer, or any two medical practitioners, to be a nuisance, the local authority may cause the person carrying on such trade to appear before the justice of peace, and if it is not proved that he does not use the best practical means for preventing or counteracting the effluvia, he is fined. The overcrowding of houses may be stopped. Provisions are also made to prevent the spread of diseases in times of epidemics, and to prevent common lodging-houses from being kept in an unclean state. The inspector of nuisances or the medical officer of health has at all times power to inspect any animal, carcass, meat, poultry, game, fish, fruit, vegetables, corn, bread, or flour, and if found unfit for food, or diseased or unsound, they may be carried away and destroyed, and the owner or dealer fined. (See also Contagious Diseases (Animals) Act.) The local authority may order house-proprietors to provide proper water-closets, to cleanse gutters and cesspools, and to remove any pool, ditch, drain, urinal, or privy injurious to health. In Scotland an act was passed the following year which dealt with the same class of nuisances, and which constituted the town-council or police commissioners the local authority for enforcing the act. The law in the United States differs little from that of England.

NUMANTIA, a town in that part of Spain called by the Romans *Hispania Tarraconensis*, is celebrated for its desperate resistance to the Roman power. The natives of Spain had continued the struggle even after the fall of Carthage, and Viriathus had endeavoured to organize a general insurrection of the Spanish tribes. The plan failed; and while the greatest part of the Celtiberians returned to submission, the Numantians, who belonged to the Celtiberian tribe Arevaci, determined to hold out. The position of Numantia on a steep height on the Douro (Duero), at the confluence of the Punto, allowed an attack only on one side, which was strengthened by art. The first attempt of the Roman forces under the command of the Prætor Pompeius Aulus (B.C. 137) was unsuccessful, and attended with great loss. Yet more disgraceful was the failure next year of the Consul Hostilius Mancinus, who was compelled to capitulate on terms which the senate refused to ratify. The commanders who succeeded avoided coming to an engagement with the brave Numantians, who amounted to 8000 men capable of bearing arms. Scipio Africanus the younger, the destroyer of Carthage, was finally sent against them, with a force of 60,000 men. He determined to reduce the place by famine, and having cut them off from all supplies, compelled the remnant to yield. Many of them, however, killed their wives and children and themselves, or threw themselves into the flames. Thus fell Numantia, which had resisted the arms of Rome for fourteen years, after a siege of fourteen months (133 B.C.) The town was destroyed by the conqueror. Soria is supposed to be built on or near the site of the ancient Numantia.

NUMA POMPILIUS, the second King of Rome, who is said to have reigned from 714 to 672 B.C. Like the other early kings, he has more a legendary than a historical existence. He is called the fourth son of Pompilius Pompo, a distinguished Sabine, and the husband of Tatia, the daughter of the Tatius who for a long period shared the kingdom with Romulus. After he had lived with her as a private individual in his native place for thirteen years he retired, upon her death, to the country, where he led a secluded life till he was called by the Romans from his retirement to the throne. Numa was not, like Romulus, a warrior, but possessed all the qualities of a lawgiver, and a just and wise ruler. He greatly strengthened the civil institutions of Rome, by uniting them with religious ceremonies. He was the founder of the Roman worship. The establishment of the colleges of pontifices, flamines, and vestals, the improvement of the calendar, the fixing of the *dies fasti* and *nefasti*, the veneration for *termini* or boundary-stones, intended for the security of property, the founding of corporations, and the abolishing of human sacrifices, are all attributed to him. The temple of Janus was closed for the first time during his reign. Tradition relates that the nymph Egeria, in the grove of Aricia, was the friend and counsellor of Numa. Some have endeavoured to make him the pupil of Pythagoras; but they lived at least two centuries apart. He left an only daughter, Pompilia, who married Numa Martius, and became the mother of Ancus Martius, the fourth king of Rome.

NUMBER. See Noun.

NUMBERS, Book of, the fourth of the books of the Pentateuch. It takes its name from the records which it contains of the two enumerations of the Israelites, the first given in chaps. i.–iv., and the second in chap. xxvi. It contains a narrative of the journeyings of the Israelites from the time of their leaving Sinai to their arrival at the plains of Moab, on the borders of the land destined to receive them. The account of their journeyings does not commence

till the eleventh verse of the tenth chapter, the previous portion of the book being taken up with a description of the preparations made for their departure.

NUMBERS, THEORY OF, the algebraic investigation of the relations existing among positive integers (numbers). A number which can be divided exactly by no number except itself and unity is called a 'prime number' or a 'prime.' Two numbers are 'prime' to one another when they have no common measure greater than one. In this article we shall merely give a few results of the analysis. If a prime number divides a product it must divide one of the factors, and hence, if a prime number divides a^n, where n is a positive integer, it must divide a. If a and b are each of them prime to c, then $a\,b$ is prime to c. If a and b are prime to one another, then a^m and b^n are prime to one another, m and n being positive integers. No rational integral algebraic formula ($a + bx + cx^2 + dx^3 +$ &c.) can represent prime numbers only. The number of prime numbers is infinite. If a is prime to b and the quantities a, $2a$, $3a$.... $(b-1)a$, are all divisible by b, the remainders will all be different. A number can be resolved into prime factors in only one way. The product of any n successive integers is divisible by $1 \times 2 \times 3 \times .... \times n$. For instance, let n be 4, and let the first integer be 17, then $17 \times 18 \times 19 \times 20$, is divisible by $1 \times 2 \times 3 \times 4$. If n be a prime number and N be prime to n, then $N^{n-1} - 1$ is a multiple of N; this is Fermat's theorem. If n be a prime number, $1 + 1 \times 2 \times 3 \times .... \times (n-1)$ is divisible by n. This is Wilson's theorem. We mention the following problems to illustrate the use which is made of theory of numbers. To find the number of positive integers which are less than a given number, and prime to it. To find the number of divisors of any given number. To find the number of ways in which a number can be resolved into two factors. To find the sum of the divisors of a number. To find the number of ways in which a number can be resolved into two factors prime to one another.

NUMERATOR OF A FRACTION, that number which stands above the line, and shows how many parts the fraction consists of, as the *denominator* represents the number of parts into which the unit is supposed to be divided.

NUMISMATICS, or NUMISMATOLOGY, is the name of the science which has for its object the study of coins and medals, especially ancient coins and medals. The word is derived from the Greek *nomisma*, through the form sometimes found in Latin, *numisma*, signifying coin or medal. The name of *coins* is given to the pieces of metal on which the public authority has impressed different marks to indicate their weight and value, to make them a convenient medium of exchange. By the word *medals* is usually understood pieces of metal similar to coins, but not intended as means of exchange, but struck in memory of some important event. The name of medals, however, is sometimes given to all the pieces of money no longer in circulation.

Medals, in the former sense of the word, were so rare among the ancients that they may almost be regarded as a modern invention. The large medals of Syracuse and the Roman medallions are the only exceptions to this general observation that need be particularly noticed. On the other hand, the coins of the ancients owe a great deal of their interest to the fact that they partook of the character of modern medals, inasmuch as they frequently commemorate some important event of recent celebrity at the time when the coin was struck, and in the case of the coins of an empire or kingdom generally give the true features of the monarch at the date of the coin.

The parts of a coin or medal are the two sides. 1. The obverse side, face, or head (*pars adversa, antica, l'avers*), which contains a portrait of the person at whose command, or in whose honour it was struck, or other figures relating to him. This portrait consists either of the head alone or the bust, or of a half or full length figure. 2. The reverse (*pars aversa, postica, le revers*) contains mythological, allegorical, or other figures. The words around the border form the legend; those in the middle the inscription. (See LEGEND.) Neither of these were originally placed on coins; the latter is frequently merely a monogram. The lower part of the coin, which is separated by a line from the figures or the inscription, is the basis or *exergue* (from the Greek, *ex ergou*, 'out of the work'), and contains subsidiary matter, as the date, the place where the piece was struck, &c.

The study of medals is indispensable to archæology, and to a thorough acquaintance with the fine arts. They indicate the names of provinces and cities, determine their position, and present pictures of many celebrated places. It is from coins alone that we derive all our knowledge of some of the most celebrated works of ancient art, particularly of ancient statuary; for example, the Jupiter of Ithome and of Ageladas; the two statues of Athena (Minerva) by Phidias, at Athens; the Venus of Cnidos, the Latona and Chloris of Praxiteles; the Hercules of Lysippus; the Ephesian Diana; the Venus of Paphos; the Juno of Samos, &c. Coins also fix the period of events, determine sometimes their character, and enable us to trace the series of kings. They enable us to learn the different metallurgical processes, the different alloys, the mode of gilding and plating practised by the ancients, the metals which they used, their weights and measures, their different modes of reckoning, the names and titles of the various magistrates and princes, and also their portraits; the different divinities, with their attributes and titles, the utensils and the ceremonies of their worship, the costume of the priests, &c. In ancient, as in modern times, while the coins of empires or kingdoms were (at least in later times) distinguished by the head of the reigning prince, those of free states were distinguished by some symbol, and sometimes these symbols are found along with the head of a reigning prince. These symbols were sometimes chosen on account of an accidental similarity between the name of the symbol and that of the state. Thus, a rose (Greek *rhodon*) was the symbol of Rhodes; a heart (Greek *kardia*), that of the town of Cardia; a pomegranate (Greek *sidē*), that of Side in Pamphylia. More frequently, however, the symbols had some local reference. Thus, Egypt was distinguished by a sistrum, an ibis, a crocodile, or a hippopotamus; Arabia by a camel; Africa by an elephant; Athens by an owl; Gnossus, in Crete, by a labyrinth; Syracuse and Corinth by a winged horse; Cumæ by sirens; Canopus by an earthenware vessel, &c. There were also a number of symbols having a general signification. Thus, a patera signified a libation, and indicated the divine character of the person holding it in his hand; the shaft of a spear denoted sovereign power; an ensign on an altar, a new Roman colony; and so forth.

The coins preserved from antiquity are much more numerous than those which we possess from the period of the middle ages, in the proportion of a hundred to one. Medals are sometimes dug up singly, or in small numbers, where they appear to have been thrown by accident; but the principal stores are found in tombs, or in places where fear, avarice, or superstition had deposited them. Till the third century the faces on medals were represented in profile.

NUMISMATICS.

ENGLISH COINS.

Coin of Cunobelinus. (Gold.)

Penny or Medal of Alfred. (Silver.)

Coin of Canute. (Silver.)

Coin of Egbert. (Silver.)

Half-penny of Edward the Elder. (Silver.)

Irish Half-penny of John. (Silver.)

Coin of Ethelred. (Silver.)

Penny of William the Conqueror. (Silver.)

Crown of Henry VIII. (Gold.)

Shilling of Henry VII. (Silver.)

Half-crown of James I. (Silver.)

Half-crown of Elizabeth. (Silver.)

Shilling of Edward VI. (Silver.)

Shilling of Cromwell. (Silver.)

Shilling of Charles I. (Silver.)

BLACKIE & SON, LONDON, GLASGOW, EDINBURGH & DUBLIN.

In the coins of the lower empire, on the contrary, we see Gothic front faces filling the whole field of medals. The moderns have employed both modes. The ancients gave more relief to the figure. The art of coining was very anciently practised in Spain. That country was deprived of the privilege of coining in the time of Caligula. The most ancient Spanish medals are of silver; their form is rude, the style of the design barbarous. The numerous cities which existed in ancient Gaul, before its conquest by the Romans, fabricated money of gold, silver, and copper. The execution of some of them is excellent, but the greatest part are barbarous. No meda's are known of Britain, with the exception of some struck by some of the emperors towards the decline of the Roman empire; and the same may be said of Germany. The medals of some of the Italian cities bear the character of Greek art, and are excellent. The medals of these cities are numerous, as the Romans permitted their inhabitants to coin money long after having subjected them. Greece and Asia Minor present many fine and curious medals. The coins of the kings of Macedon are the most ancient of any yet discovered bearing portraits; and Alexander I., who commenced his reign about 500 years B.C., is the earliest monarch whose medals have yet been found. Then succeed the sovereigns who reigned in Sicily, Caria, Cyprus, Heraclea, and Pontus. Afterwards comes the series of Kings of Egypt, Syria, the Cimmerian Bosporus, Thrace, Parthia, Armenia, Damascus, Cappadocia, Paphlagonia, Pergamos, Galatia, Cilicia, Sparta, Pæonia, Epirus, Illyricum, Gaul, and the Alps. This series reaches from the era of Alexander the Great to the Christian era, comprising a period of about 330 years. This must be accounted the third medallic series of ancient monarchs; and the fourth and last descends to the fourth century, including some of the Kings of Thrace, of Bosporus, and Parthia, with those of Commagene, Edessa or Osrhoene, Mauritania, and Judea. A perfect and distinct series is formed by the Roman emperors, from Julius Cæsar to the overthrow of the empire by the Goths, and, indeed, still later.

The Grecian medals claim that place in a cabinet from their antiquity, which their workmanship might insure to them independently of that adventitious consideration. It is observed by Pinkerton that an immense number of the medals of cities, which, from their character, we must judge to be of the highest antiquity, have a surprising strength, beauty, and relief in their impressions. About the time of Alexander the Great, however, this art appears to have attained its highest perfection. The coins of Alexander and his father exceed all that were ever executed, if we except those of Sicily, Magna Græcia, and the ancient ones of Asia Minor. Sicilian medals are famous for workmanship, even from Gelo's time (died 478 B.C.) The coins of the Syrian kings, successors to Alexander, almost equal his own in beauty. But adequate judges are constrained to confine their high praises of the Greek mint to those coins struck before the subjection of Greece to the Roman Empire.

The Roman coins, considered as medals in a cabinet, may be resolved into three great divisions, those of the older republic, the consular, and imperial. The consular coins seldom or never bore the names or titles of consuls till towards the close of the republic; nevertheless they are not improperly called *consular*, because they were struck in the consular times of Rome. These have also been denominated 'coins of families,' and are arranged according to the names inscribed on them. The brass consular coins are rather uninteresting, consisting chiefly of large unwieldy pieces, with types of insipid similarity. Few of them have any imagery or symbol. Gold was first coined at Rome in 207 B.C., sixty-two years after the application of the mint to silver. The general gold coin is the *aureus*. The consular coins, whose number is estimated at 200 in brass and 2000 in silver, extend not to above 100 in gold, most of which are curious. The name of *imperial* medals is applied specifically to those struck after the conclusion of the republican era of Rome down to the fall of the Roman Empire. Caius Julius Cæsar was the first Roman who obtained permission to put his figure upon medals. The triumvirs had each his set of medals. The medals struck after the death and apotheosis of Augustus bear the title *Divus Augustus*. With Constantine commences the series of medals of the emperors of the East or of Constantinople, down to the last of the Palæologi. The colonial medals had sometimes Greek, sometimes even Punic legends; but those with Latin only are far more numerous. Some of these coins are elegant; but they are for the most part rude and uninteresting. They begin with Julius and Antony, and occur only in brass. Most of the gold consular coins are of great beauty and high value. The coins of the middle ages embrace the *bracteates*, &c., which, after the dissolution of the Roman Empire, were circulated in the newly-formed European states—the second *incunabula* of the forgotten art of coinage.

The materials of which the ancient coins were composed were, as in modern times, gold, silver, and the various modifications of copper. More rarely electrum (an alloy of gold and silver), and an alloy of silver and tin, were used, and still more rarely lead. There were also coins made with the main body of copper, but with a thin covering of gold or silver, either laid on in the form of a thin plate, or by dipping the coin in the molten metal. These, however, were due to false coiners. That gold, silver, and bronze were the only materials used among the Romans appears highly probable from numerous specimens of the coins of the second triumvirate, on the reverse of which the *triumviri*, who had the superintendence of the mint, used to denominate themselves: IIIVIR.A.A.A.F.F., that is, *Auro Argento Aere Flando Feriundo*, 'triumvirs for coining in gold, silver, and bronze.'

We now proceed to give descriptions of the coins on Pl. CXXXV., which exhibit specimens of English coinage at different periods. See also the article COINING AND COINAGE.

Fig. 1. A gold coin of Cunobelinus; obverse, the legend CAMV. for *Camulodunum*, Colchester: reverse, two horses and a wheel; the legend CVNOBILI.

Fig. 2. A coin of Alfred, bearing on the obverse a bust of the king, ornamented with a plain double fillet and jewel in front; legend ÆLFRED REX; reverse, the name of the moneyer TILEVINE MONETA and LONDI, in a monogram.

Fig. 3. A coin of Egbert, bearing on the obverse a rude bust of the monarch; legend ECGBEARHT REX; reverse, the legend OBA MONETA, and a monogram.

Fig. 4. A coin of Edward the Confessor, bearing bust with a plain double fillet, and legend EADWEARD REX: reverse, the representation of a church, as is supposed, and the legend VVLFSIGE.

Fig. 5. A coin of Ethelred, bearing on the obverse the bust, adorned with a single fillet, legend ÆTHELRED REX ANGLORUM; reverse, in the centre *a* and *ω*, with the hand of Providence, legend VALTFERTH. MOGIP., that is, Ipswich.

Fig. 6. A coin of Canute, bearing on the obverse a bust of the king, with a kind of bonnet or helmet surrounded by a fillet; both that and the bonnet have the ends pendent and ornamented with pearls; also a sceptre, surmounted with a *fleur de lis*, legend

CNUT. REX. Reverse, MOKULFON. STAM. that is, Stamford.

Fig. 7. An Irish halfpenny of King John; obverse, full face in a triangle, which is supposed to represent the Irish harp, legend JOHAN REX. Reverse, in a triangle, a crescent, and blazing star, with a small star in each angle of the triangle, legend WILLEM ON DI., that is, Dublin.

Fig. 8. A penny of William, which is ascribed to the Conqueror, from the circumstance of the double sceptre, to which his son Rufus had no pretension; the sceptre in his right hand is surmounted with a cross paté or holy cross; that in his left is surmounted with three pellets or pearls crosswise at the point, legend PILLEM REX ANGLOR.; the Saxon P (that is V or W) being invariably used on these coins. Reverse, a cross, with four sceptres, *bottonné* or *pommetté* in the quarters, in form of an *escarboucle*.

Fig. 9. A shilling of Henry VII. Obverse, profile of the king to the left, with a crown of one arch only; mint mark a *fleur de lis* on both sides; legend HENRIC'. SEPTIM'. DI. GRA'. REX. ANGL'. Z. FR'. Reverse, the arms of France and England quarterly, in a plain shield, surmounted by a cross *fourché*. In the smaller coins is a key on each of the lower quarters of the cross below the base of the shield; legend POSUI DEUM ADIUTORE' MEUM. The coins of this reign were distinguished from those of preceding reigns by several particulars: the arms of England and France took place of the pellets; numerals, as VII., were first used on some coins, to distinguish the kings of the same name, besides the exchange of the side face for the full face: a practice which has continued ever since, with this difference only, that the heads are sometimes turned to the right, and sometimes to the left.

Fig. 10. A crown of Henry VIII., which is supposed to have been struck upon Henry's assuming the supremacy, and to have served more as a medal than a coin. Obverse, face nearly full, bust to the waist, crown of *fleurs de lis*, and plain crosses; in the right hand a sword resting upon his shoulder, and in his left the orb, with the cross, denoting thereby that he was ready to defend his dominion and faith by the sword; legend HENRIC'. 8. DEI. GRACIA. ANGLIE. FRANCI'. Z. HIBERN. REX. Reverse, the royal arms crowned and supported by a lion and a dragon; legend ANGLICE Z. HIBERNICE ECCLESIE SUPREMUM CAPUT, and beneath the shield, H. R.

Fig. 11. A shilling of fine money of Edward VI. Obverse, a bust of the king full-faced, crowned, and in parliament-robes, with a chain of the order of the Garter; on one side of the face a double rose, and on the other XII. to denote the value; legend EDWARD VI. D. G. AGL. FRA. Z. HIB. REX. Reverse, arms in a plain shield, surmounted by a cross *fourché*. This is supposed to be the first and only English coin or medal whereon the collar of the order of the Garter is to be seen; but, whether from the mistake of the engraver, or any other cause, this is different from the collar of the order appointed by the statutes of Henry VIII., which was to be composed of double roses encompassed with the garter; whereas this has single roses of four leaves only, without garters, and without knots between. The silver coins of this reign were the last on which the heads of any of our princes have been represented with a full face.

Fig. 12. A half-crown of Queen Elizabeth. Obverse, bust of the queen, having the hair curled in two rows next the face, and turned up behind; ruff and gown richly ornamented; sceptre *fleuré* in the right hand, globe or mound in the left; mint mark on both sides the Arabic figure 1; legend ELIZABETH D. G. ANG. FRA. ET HIBER. REGINA.

Fig. 13. A half-crown of James I. Obverse, the king on horseback, in profile to the left, crowned, and in armour. In his right hand a drawn sword; the horse ambling; on the housing a rose crowned; mint mark on both sides a thistle; legend JACOBUS D. G. ANG. SCO. FRAN. ET HIB. REX. Reverse, in an escutcheon, highly ornamented, the royal arms, quarterly; first and fourth, England and France, quartered; Scotland in the second; Ireland in the third. The arms of Ireland now appear for the first time upon the coins.

Fig. 14. A shilling of Charles I. Obverse, bust of the king, crowned and in armour, with long hair, the object of puritanical abhorrence; mint mark on both sides an anchor; legend CAROLUS D. G. MA. BR. FR. ET HI. REX. Reverse, arms of England, France, Ireland, and Scotland, on a plain square shield, and cross *fleuré;* legend CHRISTO AUSPICE REGNO.

Fig. 15. A shilling of Cromwell. Obverse, bust in profile, with a laurel wreath and a Roman mantle; legend OLIVAR. D. G. R. P. ANG. SCO. HIB, &c. PRO. Reverse, in a shield, surmounted by an imperial crown, quarterly, first and fourth, St. George's cross for England; second, St. Andrew's cross for Scotland; third, the harp for Ireland. On an escutcheon of pretence a lion rampant; legend PAX QUÆRITUR BELLO 1658.

With regard to the coinage of Scotland it is believed that there exist silver pennies of Alexander I., who reigned in 1107; and there certainly are some of Alexander II. in 1214, as also of David in 1124. There are many coins of William I. in 1165; and a large hoard of his pennies was found at Inverness in 1780. From the time of James I., in whose reign a standard of coinage was established the same as that in England, the money of Scotland was of the same value with that of England until the vast drain occasioned by the enormous ransom of David II., after which its size was reduced; and its value continued to diminish to such a degree that in 1600 it passed only for a twelfth part of the English money, and remained at that low ebb until the union of the two kingdoms.

The only silver coin was the penny until the year 1293, when Alexander III. coined also halfpence; and there are silver farthings of Robert I. and David II. The groat and half-groat were also introduced by the latter, which completed the set of Scottish silver. These all ceased to be coined in the time of Queen Mary, when shillings were first coined, with the bust of the queen on one side and the arms of France and Scotland on the other. The silver crown, of the value of 30*s.* Scots, was first coined in 1565; smaller pieces of 20*s.* and 10*s.* were likewise struck, and marks of silver worth 3*s.* 4*d.* English. These coins have the mark XXX., XX., X. upon them to denote their value. The motto *Nemo me impune lacesset* first appears on Scottish coins in 1578. The crown of 1 oz. weight gradually increased in nominal value until in 1601 the mark was LX. In the time of Charles I. half marks, 40, and 20 penny pieces were coined. In 1665 the Scottish dollars first appeared, in value 56*s.* Scots, with the half and quarter of proportional value. In 1686 James VII. coined 60*s.*, 40*s.*, 20*s.*, 10*s.*, and 5*s.* pieces; but only those of 40*s.* and 10*s.* are known. At the union of the kingdoms all the Scottish coins were called in and recoined at Edinburgh, with the mark E under the bust. In general the Scottish silver coins are equal if not superior in execution to the English.

Gold was first issued in Scotland by Robert II. The pieces were at first called St. Andrews, from the figure of that tutelar saint upon the cross. The lion was another name for the largest gold coins, from the

arms of the kingdom upon it. Then comes the unicorn under James III., which was followed by the bonnet-pieces of James V., first struck in 1539, which last are of admirable workmanship. The last gold coined in Scotland consisted of the pistole and half pistole, of £12 and £6 Scots, which have the sun under the head.

The Scottish copper coinage is of an earlier date than that of England. It was preceded by money of billon, called black money, consisting of copper washed with silver. The true copper coinage began in the time of James VI. The *bodle*, so called from Bothwell the mint-master, was worth two pennies Scots. The *baw-bee* (*bas piece*) was also coined, corresponding with the English halfpenny. Some pieces called Atkinsons were also coined by James VI. in 1582, which went for a third more than the value of the baw-bee. Besides these there were the *hardie* and the *plack*, the former worth three, the latter four pennies Scots. The Scottish coins of Charles I. are very rare.

Numismatics appear to have been entirely unknown as a science to the ancients. It does not appear from any ancient works that any value was set upon coins as curiosities by the collectors of works of art in the times of Augustus and the Antonines, though there were at that time series of coins of cities, some of which have come down to us, and attract attention on account of their antiquity and the beauty of their execution. Such are the coins of Sybaris and the cities of Magna Græcia, which, with their independence, lost the right of coinage. This disregard is more remarkable, as gems, which are so nearly allied to them, were in high esteem; but in the fifteenth, and particularly in the middle of the sixteenth century, princes (Matthias Corvinus of Hungary, the Emperor Maximilian I., Francis I., and Henry II. of France, Queen Christina of Sweden) and private individuals of wealth and culture, particularly in Italy, France, and Germany, rivalled each other in zeal for collecting these remains of antiquity, at first principally with a view of obtaining portraits of the chief characters of Roman history. Learned treatises soon succeeded these first collections, in which the chief attention had been paid to striking impressions. The earliest treatises upon numismatics were those of the Italian Enea Vico and the Spaniard Antonio Agostino, both published in the sixteenth century. Jac. and Octav. Strada, by works illustrated with plates, drew the attention of the great and the rich to this subject. Wolfgang Lazius, physician to Ferdinand I., made use of coins for the illustration of history. Fulvio Orsini and Ad. Occo, a physician at Augsburg, applied themselves to the study of the Roman family and imperial coins; and it is to be regretted that the latter restricted himself so much in his inquiries, for his process, with respect to chronological arrangement, was confessedly good. Hub. Goltz, a Dutch antiquary of the latter half of the sixteenth century, is particularly worthy of mention as the first who paid much attention to Grecian coins; but there is a want of accuracy in the writers of that period, which renders a great part of their labours useless. Goltz was at once a draughtsman and an engraver, but suffered himself to introduce so much of his own invention into his engravings of coins that they are liable to suspicion in many cases where they may have been correct. Meanwhile the art of imitating the genuine antique coins began to be practised. At first, without any intention of deceiving, but merely to facilitate the study, the skilful die-cutters, Cavino, Belli, &c., at Padua, Parma, and Vicenza, Dervieux at Florence, Cogornier at Lyons, made imitations of ancient coins; but these imitations were afterwards passed off for genuine, and soon became an article of trade, which has continued to this day. For genuine connoisseurs there is one great protection against counterfeit coins, namely, what is called the patina. That is a bluish green or brownish incrustation which forms on coins of great antiquity, and which the makers of counterfeit coins find it extremely difficult if not impossible to imitate with perfect exactness. See Sestini's Sopra i moderni falsificatori di medaglie greche antiche (Florence, 1826).

The great numbers of counterfeit coins deterred many during the period which now commenced from the study of numismatics, at least it lessened the taste for this study, always difficult on account of the learned apparatus necessary; but the researches into separate departments of the science became more extensive, and the works of Vaillant, Spanheim, J. J. Gessner, Pellerin, not to mention numerous others, who have applied immense stores of learning to the illustration and explanation of numismatics, are well worthy of attention, though they are not to be implicitly trusted. The materials had now so much increased by the accumulation of newly-discovered pieces (Vaillant visited the East several times; Pellerin added to the Parisian cabinet alone 33,000 ancient coins) that a critical selection and arrangement of the genuine became doubly necessary in order to facilitate a general survey of them. Joseph Eckhel undertook this task with success, and by a strict geographical and chronological method introduced so much order into this science that great light was shed upon many obscure points of history and archæology. His system was first practically applied by himself to the arrangement of the cabinet at Vienna, and afterwards presented in an improved form in his great work Doctrina Numorum veterum (Vienna, 1792–98, nine vols. 4to), to which all later researches can only be considered as additions or improvements. Domenico Sestini followed this system in his works upon the numismatic Hermæ—Lettere e Dissertazione Numismatiche (nine vols. 1789–1806); Mionnet, in his Descr. des Médailles antiques grecques et romaines (Paris, six vols. 1806–13); Pinkerton's Essay on Medals (London, 1789) and Grässe's Handbuch der alten Numismatik (Leipzig, 1853) are among the other leading works of a general character on the subject of numismatics. The investigations into the mixtures of metals and the execution of the stamps; the form, size, weight, value, and number of the ancient coins; their genuineness or spuriousness, become susceptible of more certainty by the accumulation of materials of comparison; and the understanding of the types and legends is also facilitated by similar means. The coins of the middle ages, which have from time to time been brought to light, are now sought for with zeal. By pursuing the same method with the modern as with the ancient coins, arranging them in a strictly chronological order, they have been made to shed light upon subjects which manuscripts have left unexplained. Of the works belonging to this department of numismatics may be mentioned the Numismatique du moyen âge by Joachim Lelewel (Paris, 1835). Among the separate works upon the coins of different countries are Pinkerton's Metallic History of England (London, 1790); Adam de Cardonnel's Numismata Scotiæ (Edinburgh, 1786); Simon's Essay on Irish Coins (Dublin, 1749); and the works of Lastonaso for Spain, Zanetti for Italy, Floravanti, Garampi, and Venuti for the popes, Le Blanc for France, Bicherodt for Denmark, &c., Becker for Germany, Voigt for Bohemia, and others.

NUMMULITE (Latin, *nummus*, money; Greek, *lithos*, stone), a genus of extinct Foraminifera—those Protozoan animals so abundantly represented in the present day in the ooze and mud of our oceans. These

forms attain a very large size when compared with the vast majority of Foraminiferal organisms; some Nummulites thus exhibiting a circumference of 3 inches. The name of these forms is derived from their round or coin-like shape. The Nummulites belong to the group of the Polythalamia, or 'Many-chambered' Foraminifera; their structure thus exhibiting a division of the limy shell into a series of chambers, coiled in a flat spiral manner. The shells of this and all other Foraminifera are secreted by the soft protoplasmic matter of which the bodies of the animals are composed. And in the walls of the compartments or chambers of the shell 'foramina' or holes exist, through which the soft protoplasm may be protruded in the form of filamentous processes, serving for locomotion and for the prehension of food. By some authorities these foramina are regarded as being the apertures belonging to a system of canals which appears to exist and to branch within the walls of the chambers of the shell, and which is supposed to have the function, in the living animal, of bringing the living protoplasm into communication with the external world. In Nummulites this canal system appears to have been of a complicated nature, and in these forms an 'interstitial skeleton' was developed, in addition to the shell, for the support of the living matter; and the canal system would seem to have been intimately connected with the growth and nutrition of this skeleton. The Nummulites show distinct points of affinity with the celebrated *Eozoön Canadense*, or 'Dawn of Life Animalcule,' found in the Laurentian rocks of Canada, and in other formations of allied age, and believed to be the first or oldest form of life which exists in a fossil state. And Dr. Carpenter says that another Foraminifer named *Orbitoides*, also extinct, and found in close proximity to Nummulitic remains, is a nearly-related, if not a 'mimetic' form of the Nummulite-genus.

The Nummulites are first represented as fossil organisms in formations of comparatively recent age. They are chiefly characteristic of, and principally found in, the middle Eocene rocks of the Kainozoic or Tertiary period of geology. Indeed, the Nummulites form so characteristic fossils of this series of formations, that it has been proposed to divide the series into three sections, by the special kind or characters of the Nummulites found in each deposit or bed. The formation known as the Nummulitic Limestone belongs to the middle Eocene series, and has been so named from the enormous quantities of these fossils found in it. These strata are literally composed of Nummulitic remains. The Nummulitic formation, according to Lyell, may be regarded as one of the most important, if not the principal formation of the Tertiary series of rocks, in point of extent. Attaining a thickness of many thousands of feet, it ranges from the Alps to the Carpathian Mountains; appears in the north of Africa, crops up in Egypt, passes into Asia Minor, appears in Persia and at the mouth of the Indus, is found in the mountains separating Scinde from Persia, and can be traced into India even to Eastern Bengal, and the frontiers of China. The pyramids of Egypt are built in greater part of this Nummulitic Limestone. The nearest living representative among the Foraminifera of the Nummulite is the genus *Nonionina*. The *Nummulites lævigatus, N. radiatus, N. lenticularis* are three familiar species among very many known.

NUN, a word of unknown origin, but supposed to be connected with a Coptic word signifying 'pure,' applied in the Roman Catholic Church to a female who retires from the world, joins a religious sisterhood, takes upon herself the vow of chastity and the other vows required by the discipline of her convent, and consecrates herself to a life of religious devotion or of pious services in behalf of her fellow-creatures. The first nunnery is said to have been that founded by a sister of St. Anthony about the close of the third century; and the first in England was founded, according to the antiquary Dugdale, at Folkestone, by Eadbald, king of Kent, in 630. For further information (relative to the history and discipline of nunneries) see the article MONASTERY.

NUNC DIMITTIS, the first two words of the Latin version of the canticle of Simeon given in Luke ii. 29–32, and used as the designation of the whole canticle. The canticle forms part of the compline office of the Roman Catholic breviary, and in the English version is found in the Book of Common Prayer of the Anglican Church along with the *Deus misereatur*, one of which two canticles is sung at the evening service after the second lesson.

NUNCIO, an ambassador of the first rank (not a cardinal) representing the pope at the court of a sovereign entitled to that distinction. A Papal ambassador of the first rank, who is at the same time a cardinal, is called a legate. The title of internuncio is given to an ambassador of inferior rank, who represents the pope at minor courts. (See MINISTERS, FOREIGN.) Formerly the Papal nuncios exercised the supreme spiritual jurisdiction in their respective districts. Gregory XIII., in 1583, appointed two nuncios with such powers for Germany, the one of whom for East Germany had his seat at Vienna, and the other for West Germany at Cologne. Sixtus V. appointed one for Switzerland at Lucerne in 1586, and one for the Netherlands at Brussels in 1588; and Pius VI., in 1785, sent another for South Germany to Munich. In Roman Catholic countries which still acknowledge the authority of the court of Rome in matters of discipline, the nuncios still exercise the same powers as formerly, but in other Roman Catholic countries (such as France and Austria), and in Protestant countries, he is simply an ambassador.

NUNEATON, a town in England in the county of Warwick, on the left bank of the Anker, 17 miles N.N.E. of the town of Warwick. It has two churches, a free grammar and several other schools. Ribbon and cotton manufacturing is carried on to a considerable extent. Pop. in 1881, 8465.

NURAGHI, the name given to certain ancient structures peculiar to Sardinia, resembling in some respects the 'Burghs' or 'Duns' found in some of the northern parts of Scotland, such as the Burgh of Mousa in Shetland. When entire they are about 50 feet high and about 90 feet in diameter, measured at the base and outside of the platform on which the largest of them are founded. The summit where preserved is a truncated cone. The materials are limestone, trachitic porphyry, granite, or volcanic rocks, obtained from neighbouring quarries. Each block forms a cube about 3 feet each way, and its surface is an irregular line, such as the blows of the hammer in shaping it may be supposed to have made; the walls are without cement, within as well as without. A wall of 10 feet, built like the main structure, forms a kind of rampart around the platform on which the *nuraghe* stands. This wall is sometimes 360 feet in circuit. Some nuraghi are flanked with cones from three to seven in number, grouped around the principal cone, and forming a kind of casemates. The inclosing wall is surrounded by a parapet 3 feet high. The wall of the nuraghe consists of two sides, placed so far apart as to admit of a spiral stair leading to the three apartments which form the three stories of each nuraghe. The roof of each apartment is arched; the entrance terminates in a flat architrave, and is sometimes so high that a man can enter without stooping, and sometimes so small that he can only creep into it on

his stomach, though it gets wider as he proceeds. Hence the low chambers are mere cells formed in the thickness of the wall, while the high chambers are supported by pillars. In the cells broken human bones mixed with earth, like that of ordinary graves, have been found. It is many centuries since these remarkable monuments attracted attention. Aristotle, or rather the author of the work De Mirabilibus, attributed to him, speaks of these structures of the island of Sardinia, which were sometimes called Greek, and were sometimes also attributed to the aboriginal inhabitants. Diodorus Siculus, relating the traditions of his time, says that these buildings, in the form of irregular polygons, like the Cyclopean monuments, dated from the time of Iolas, nephew to Heracles, who had brought a colony to the island twenty years after Aristæus had come at the head of the Tyrrhenians. The subject possesses sufficient interest to occupy the labours of modern archæologists, among whom Albert de la Marmora deserves special notice for his large work on the subject, furnishing very accurate descriptions. The origin and aim of these structures is still, however, not free from doubt, though they are generally regarded as tombs, constructed so as to be available, on emergencies, for purposes of defence. The largest of the nuraghi are at Burgos and Ploaghe, both in the province of Sassari. The most important question with regard to them is, whether they are of eastern or western origin. Champollion Figeac decides for the latter.

NÜRNBERG (English, *Nuremberg*), a town in Bavaria, in Middle Franconia, the second city in the kingdom, and once the greatest and most wealthy of all the free imperial cities of Germany, on the Pegnitz, 93 miles N.N.W. of Munich. It is surrounded by an ancient wall flanked with towers and pierced with 10 gates, the whole inclosed by a dry ditch 100 feet wide and 50 feet deep; but parts of these fortifications have been recently removed to make way for the great extensions and improvements which have recently taken place. The Pegnitz, traversing the town from east to west, divides it into two nearly equal parts—the north, or Sebalderseite, and the south or Lorenzerseite, which communicate by numerous bridges. The characteristic feature of the town is the venerable air of antiquity which invests it. The stranger who threads its narrow and irregular street, lined with solid but quaint gable-faced houses, standing entire as they were originally built, might fancy himself carried back several centuries. It is only lately that some of the streets have been widened and renewed, so as to wear a modern appearance. The most remarkable edifice is St. Sebald's church, which gives its name to the north division of the town, a Gothic structure of great elegance externally and internally (its older parts dating from the 10th century), containing the tomb or shrine of St. Sebald, executed in bronze by Peter Vischer, who, with his five sons, laboured upon it for thirteen years, and adorned it with nearly 100 figures, among which those of the apostles are conspicuous for size and beauty. Other buildings deserving of notice are the church of St. Lorenz, containing a remarkable pix by Adam Krafft, exquisitely sculptured in white stone, 64 feet in height; the town-house, an Italian building of three stories, with a fine front, and a great hall, the walls of which are decorated with paintings in oil, many of them by Dürer; the Reichsschloss, or imperial castle, in the north-west corner of the town, towering above all its other houses, and containing within its court a remarkable lime-tree said to have been planted by the hands of Queen Kunigunda, and now above 700 years old; and the Gothic chapel of St. Maurice, now converted into a picture-gallery. Among the other places of interest are the house of Wilibald Pirkheimer (a celebrated Nürnberg magistrate) in the Ægidienplatz, a square adorned with a statue of Melanchthon, by Burgschmiet; and the house of Albert Dürer, in a street named after the artist himself. There are numerous benevolent and educational institutions. Before the passage to the East Indies round the Cape of Good Hope was discovered Nürnberg was one of the greatest commercial places in the world, as it was the great mart of the produce of the East coming from Italy and going to the North. But the change in the commercial world, the devastations of the Thirty Years' war, and the antiquated institutions of the city, put a stop to her prosperity. Yet the manufactures of the place are still considerable, and are rapidly rising in importance. Among the most important at the present day are cotton and woollen cloth, machinery, hardware, wire, needles, tobacco, pencils, colours, dyes, musical and scientific instruments, mirrors, hosiery, paper, combs, turnery, beer (for export), &c. The toys made here and in the neighbourhood go to all parts of the world, and in Britain are generally known as Dutch toys. Printing and bookbinding are also extensively carried on. There are several schools specially intended for the training of mechanics in the branches of knowledge likely to be useful to them in their occupations; and since 1872 there has been established a large industrial museum. The town is celebrated, in connection with its industry, for the invention of watches, wheel-locks (used in discharging old muskets), gauge-plates for drawing brass-wire, clarionets, and air-guns.

Nürnberg, though an ancient city, does not carry its origin so far back as Roman times. It had acquired considerable importance in the tenth or eleventh centuries, and has been frequently visited by the emperors of Germany. It was greatly enlarged by Conrad III., and received several embellishments and important privileges from Frederick Barbarossa. In 1219 it was raised to the rank of a free city of the empire. It early took part in the Reformation. Subsequently it suffered during the great European wars, and being repeatedly laid under contribution by both parties, became so exhausted, that the sources of its prosperity were almost dried up, and the population rapidly decreased by extensive emigration. Having finally incurred a load of debt, which made it an acquisition of little value to any state, it was formally taken possession of in 1806 by Bavaria, which undertook the settlement of its debts, and, by judicious arrangements, has considerably increased its trade. Many distinguished individuals have been born here. Among others may be mentioned the poets Fenzing and Hans Sachs (to whom a statue was erected in the town in 1874), the mathematician Behaim, the painter Albert Dürer, and the sculptors Peter Vischer and Adam Krafft. Pop. (1880), 99,519.

NURSERY, a place where vegetables, flowering plants, and trees are raised from seed in order to be sold in their young state either for use as food or for transplantation. The use of the word *seminarium* by Columella in the same sense is evidence that the practice of raising plants and trees in nurseries is a very old one. The advantage of having separate places devoted to this purpose consists in this, that more attention can in that case be given to the objects of culture at the time when particular care is required by them. In the case of trees there is another great advantage in the fact that they can be selected from the nursery at a stage of their growth at which it can be pretty satisfactorily determined that they are likely to thrive, so that the person planting escapes the danger of having unsightly

gaps in his rows of trees or in his plantation through the failure of some of the seeds. There is only one objection to the practice of raising trees in nurseries, and that is that the young trees are likely to be injured by transplantation; but though it is admitted that trees which have grown from seed in the spot where they are intended to remain, and which have not succumbed to the numerous accidents from which they are liable to suffer when young, afterwards develop with more vigour than those which have been transplanted, yet it is not thought that this advantage is sufficient to compensate all the disadvantages of that system, and it is accordingly usual to grow plantations from young trees raised in the nursery. In raising flowering plants and ornamental plants for gardens, nurserymen have contributed greatly to the advancement of the art of gardening and even the science of botany by the efforts which they have made to introduce exotic plants into their own country, and by the attention which they have devoted to discovering the best means of cultivating them. Nurseries are parcelled out into several plots according to the different kinds of plants or trees to be raised. One part is assigned to the ordinary culinary vegetables; others to flowering plants requiring different kinds of soil; another to forest trees with caducous leaves; another to ornamental trees and shrubs with caducous leaves; another to trees and shrubs with persistent leaves; and another to fruit-trees. Sometimes also different parts of the nursery are allotted to the various operations, such as budding and grafting, by which trees are propagated. The nurseries of certain countries enjoy a peculiar reputation for the raising of certain kinds of plants. Thus the Dutch nurseries have long been celebrated for their bulbous roots, with which they supply in great numbers the nurseries of other countries. Similarly the French nurseries are famed for their roses and orange-trees.

NUT, in botany, a one-celled fruit containing when mature only one seed, and enveloped by a pericarp of a hard, woody, or leathery texture, rarely opening spontaneously, and then dividing into only two valves. The common hazel-nut is an example of a nut with a hard, and the chestnut of one with a leathery pericarp. The walnut affords an instance in which the pericarp or outer shell opens spontaneously. In the filbert the valves are marked with a superficial line and can easily be opened with a knife, although they do not open spontaneously. In those cases in which the pericarp does not open spontaneously the seed (called the nucleus or kernel) is extricated either in the process of germination or in consequence of the decay of a part of the pericarp. The import of nuts into the United Kingdom for various purposes is now very large, exceeding £3,000,000 in yearly value. The hazel-nut is the most largely imported of the edible nuts; next come walnuts, which are brought from France and Belgium. Many kinds of nuts (such as the cocoa-nut, Brazil-nut, almond-nut, walnut, hazel-nut, beech-nut, &c.) are valuable for the oil they contain, which is used in cookery, perfumery, and in other ways. Various other kinds of nuts are used for special purposes. Thus Valonia-nuts, gall-nuts (not, strictly speaking, nuts—see GALLS), and Myrobalan-nuts are used in tanning and dyeing, the last two also in ink-making; betel-nuts in making tooth-powder and tooth-paste; and coquilla-nuts and vegetable-ivory (the kernel of the nut of the Peruvian palm), being very hard and capable of taking on a fine polish, are used in making small ornamental articles of turnery.

NUTATION. The motion of the earth on its axis is one of 'precessional rotation.' (See PRECESSION.) On a celestial globe the axis of the earth describes a curve round the pole of the ecliptic, because of its precession. Superimposed on this motion of the axis is its nutation, which, if existing alone, would cause the axis to describe an ellipse every nineteen years on the celestial globe, its major axis being directed to the pole of the ecliptic. The effect of nutation is to cause a wavy line to be described by the axis round the pole of the ecliptic. Precession causes the nodes of the earth's equator to describe a revolution in 25,866 years; nutation causes the nodes to move 6·87″ alternately in advance and behind the mean position due to precession. Bradley discovered and explained nutation not long after his discovery of the aberration of the fixed stars.

NUTCRACKER (*Nucifraga caryocatactes*), a genus of Insessorial or Perching Birds, included in the Conirostral section of that order. It has generally been classified with the family of the Corvinæ or True Crows, and in this arrangement the nutcracker becomes a near ally of the magpie, &c. Temminck placed it intermediately between the jays and choughs. It possesses the conical bill of its section; the beak being straight, obtusely pointed, and longer than the head. The nostrils are rounded and concealed by hairs. The two outer toes are united at their bases. The wings are long and pointed; and the first quills are short. The common nutcracker inhabits Europe generally, but is rarely seen in Britain. It also extends into Northern Asia, and occurs in Kamtchatka. In size the nutcracker resembles a jay or jackdaw. The general body plumage is of a reddish or amber colour, spotted with oblong white patches. The wings and tail are of a black colour, and exhibit a greenish lustre. The nest is formed in the hollows of trees. The eggs number five or six, and are of a white or grayish colour, spotted with grayish-brown. Its food appears to consist of nuts, fir-seeds, and insects; and its familiar name has been derived from the belief that it cracks the nuts on which it feeds by fixing them in the crevices of trees, and by striking them with its bill. In confinement this bird was never seen to crack nuts, but it was found to be extremely fond of the extracted kernels. Its habits are also said to resemble those of the woodpecker, in that it taps trees with its bill, and by thus alarming the insects causes them to emerge and then devours them. It has also been credited with devouring the eggs and young of other birds; but this belief is as yet purely theoretical. Mr. Gould has described a second species of this genus from the Himalayas, under the name of *N. hemispila*.

NUTGALLS. See GALLS, GALL-FLY, and GALLIC ACID.

NUTHATCH (*Sitta Europæa*). The Nuthatches or Sittinæ form a sub-family of the Certhidæ or Creepers, which are included in the section Tenuirostres ('slender-billed') of the order Insessores or Perchers. The toes in this sub-family are elongated and of slender conformation. The claws are long, curved and compressed in shape. The outer toe is longer than the other, and is joined by membrane to the middle toe, as far as the first joint. The inner toe is united at its base. The wings are of moderate size; the tail being short. The common Nuthatch averages about 5 inches in length. Its body is of robust make, the colour being bluish gray on the upper portion, and light reddish yellow on the lower parts. The sides are brown; and the throat and cheeks white. A black band or streak passes from the base of the bill to the shoulders. The colours of the female are not so brilliant or definite as those of the male. The nest is constructed in the holes of trees, and this bird is said frequently to select the former habitation of the woodpecker, to which, in

general habits, those birds bear a close resemblance. The nest itself is lined with oak-leaves. The female lays six or seven eggs, of a white colour, spotted with brown. These birds are said to defend their nest with great vigour, and to abide by their habitation in the face of obvious persecution. They do not appear to possess any definite or distinct song-notes. The food consists chiefly of insects, which it seizes or gropes for by aid of its strong curved claws. Nuts also form part of its dietary. The bird fixes the nuts in the crevices of trees, and opens them by cracking with repeated strokes of its bill. In general habits the Nuthatches are active and agile, and are generally found in solitary pairs. It may be seen descending trees head foremost, an unusual mode of progression, but one in which the strong hinder claw greatly assists it. These birds occur chiefly in the Old World, but they are also represented in North and South America. The *Sitta Europæa* occurs in Britain, and Yarrell says that it may occasionally be seen in the neighbourhood of London. Another European species has been described, and between all the members of this group there is a strong general resemblance. (See Pl. CXLIV.–CXLV. fig. 5.)

NUTMEG. The use of this fruit for culinary purposes is well known, and is now everywhere familiar throughout the civilized world. With the East Indians it is, besides, employed as a masticatory. It does not, however, appear to have been very anciently known, at least among Europeans; for the Greeks and Romans have left no account of it, and it is first mentioned by the early Arabian writers. The tree (the *Myristica officinalis* or *Myristica moschata* of botanists) is a native of the Molucca Islands, and is remarkable for the beauty of its foliage. It attains the height of about 30 feet, and the branches are disposed four or five together, almost in whorls, forming a rounded and very dense summit. The leaves are alternate, petiolate, smooth, ovate-lanceolate, of a fine green colour above, and paler beneath. The flowers are dioecious, small, yellowish, and inconspicuous. The fruit is a drupe, about as large as a peach, smooth externally, and yellow when it arrives at maturity; the outer envelope is fleshy, and opens at the summit into two valves, disclosing the scarlet mace which forms the second envelope; the mace is a fleshy fibrous membrane, having a reticulated appearance, which turns yellow with age, and becomes brittle when dry; the third envelope is thin, hard, and blackish-brown; the nut, or more properly kernel, consists of a very firm, white, oily, substance, penetrated with numerous irregular branching veins. The tree constantly bears flowers and fruits of all ages, and its leaves fall so insensibly that the loss is not perceived. About nine months are required to bring the fruit to maturity. Mace is very commonly employed as a culinary spice, and resembles the nutmeg in taste and odour, but is more pungent and bitter. From the nut is expressed a fatty substance of a reddish-yellow colour, and of about the same consistence as butter, from which circumstance it is called the butter of nutmeg. A volatile oil is also obtained from it, called the oil of mace. The name of oil of mace is sometimes improperly given to the butter. For a long time the Dutch had the monopoly of the commerce in nutmegs, but about the year 1770 the tree was introduced into Mauritius, and thence passed into Surinam, the West Indies, and other parts of tropical America.

NUTMEG-OILS. The seeds of *Myristica aromatica* yield, by distillation with water, about 6 per cent. of a transparent oil, having a specific gravity ·948, an odour of nutmeg, and a burning, aromatic taste. When this oil is allowed to stand it deposits a camphor called *myristicine*.

NUTRITION, that one of the three great physiological functions through which the living organism selects, appropriates, ingests, digests, absorbs, and elaborates nutritive material or food. It thus involves and comprehends all those acts and processes which are devoted to the repair of the bodily waste, and to the maintenance of the growth and vigour of the being. Under this head are therefore included the digestive, absorptive, circulatory, and respiratory processes, and those secondary or secretory actions which form part of these chief functions. The function of nutrition bears a very intimate relation, in a general sense, to the function of *reproduction*, and to the third great function, that of the nervous system known as *correlation*. Nutrition is thus antagonistic or opposed to reproduction, for we generally find that the energies of the being when devoted to reproductive acts impair its nutrition; and proportionally as the work of nutrition is perfectly performed, so will the correlative function be perfectly and normally subserved.

Nutrition in certain cases, as exemplified in the metamorphic processes of insects, &c., and in the early life and growth of most animal and plant forms, bears also a close relation to *development*. The earlier stages of such processes of metamorphosis (which see) are nutritive in their character; and we generally observe that no sexual organs are developed in these embryonic forms, their entire energies being devoted to nutrition and growth. In their later or reproductive history, on the contrary, we find the process of nutrition either to be held in abeyance, or to bear a minor part only, in the life-history of such forms. See also Aliment, Chyme, Digestion, Circulation, &c.

NUTWEEVIL (*Balaninus nucum*), a genus of Coleoptera or Beetles, included in the section *Tetramera* of that order. This section is distinguished by possessing four developed joints or segments in the tarsi. The soft, footless, larval form of this beetle exists in the interior of filbert and other nuts, the eggs being deposited by the female, which eats through the nut-shell. The larva, after escaping from the nut, passes its pupa or chrysalis state in the ground, this change occupying till the beginning of the second summer. These insects, with others, are denominated *Rhynchophorous* or 'snout beetles,' from the possession of an elongated rostrum or snout; the mouth being situated at the extremity of this projection. The antennæ are generally clavate or club-like at their extremities. This horny rostrum is used by the female in her ovipositing or drilling operations.

NUX VOMICA (*Strychnos nux vomica*), an East Indian tree of moderate size belonging to the natural order Loganiaceæ or Spigeliaceæ. All parts of the plant are bitter, but not milky. The leaves are opposite and entire; the corolla is monopetalous and tubular, surrounding five stamens and a single style. The fruit is globular, about as large as an orange, and contains several seeds. These seeds are circular, flat, with a prominence in the middle on both sides, of a gray colour, and covered with a woolly substance, but internally hard and horny. They are exceedingly poisonous, containing the deadly alkaloid *strychnine* or *strychnia*, and *brucine*, another poisonous alkaloid. Strychnine was first discovered in 1818 by Pelletier and Caventou, and was afterwards found to exert a remarkable influence on the spinal marrow, which has led to its use in certain spinal affections.

NYANZA. See Albert Nyanza and Victoria Nyanza.

NYASSA, a large lake in South-eastern Africa, out of which flows the Shire, a northern tributary of the Zambesi; lat. from 9° 20′ to 14° 25′ S.; lon. from 34° 20′ to 35° 40′ E.; discovered by Livingstone in

1859. The length of the lake is above 300 miles, and it varies in breadth from about 15 to more than 50 miles. The surface of the lake is 1522 feet above the sea-level; its waters are sweet and abound in fish. In 1876 an English mission station was founded at the south end of the lake, and named Livingstonia in honour of Livingstone; and Mr. E. D. Young, the leader of the mission, sailed round the lake in a steamer belonging to the mission, which had been carried to its destination overland. Mr. Young discovered that the lake extends fully 100 miles further north than Livingstone believed.

NYBORG, a seaport in Denmark, on the east side of the island of Fünen, 17 miles E.S.E. of Odensee. It is strongly fortified, and has good building-docks, and a harbour at which there is a considerable trade in grain. All vessels passing the Great Belt pay their dues here. Pop. (1880), 5402.

NYERUP, Rasmus, an eminent Danish literary historian, born at Fünen in 1759, studied at Copenhagen, in 1778 obtained an appointment in the royal library, in 1796 became professor of literary history, and died in 1829. By his excellent Spicilegium Bibliographicum, his Symbolæ ad Literaturam Teutonicam, and his Historico-statistical View of the Condition of Denmark and Norway in Ancient and Modern Times, he has rendered essential service.

NYKERK. See Nijkerk.

NYKÖPING, a seaport town in Sweden, capital of Södermanlän, and at the mouth of the river Nyköping, on the Baltic, 54 miles south-west of Stockholm. It has manufactures of linen, cotton, and woollen goods, needles, paper, tobacco, &c. Pop. 4813.

NYL-GHAU (*Portax* or *Antilope picta*). This animal, a member of the Antelope family, is found in the northern and north-west parts of India. It attains the height of an ordinary deer or stag, measuring about 4 feet from the ground to the shoulders, whilst in length it attains similar dimensions. The body is of a grayish colour, with white patches on the lower and upper jaws, on the throat, belly, and inner aspects of the thighs. The female is of a lighter colour than the male. In general conformation this animal presents a singular combination of the structural features of various animals. Thus the body resembles that of a bull or cow in general shape, and the head, neck, and legs are like those of a deer; the neck possesses a mane, and the tail is tufted. The horns, possessed by the males alone, measure from 6 to 7 inches in length, and attain a circumference at their bases of 6 inches. They are curved upwards, and exhibit a lunate or somewhat lyre-shaped conformation. The name Nyl-Ghau literally means 'blue ox,' and has, doubtless, been applied to this animal from the ox-like proportions of its body. The food consists of grass, hay, &c. In habits these animals are generally tame and gentle, and they are known to breed freely in confinement.

NYMPH, a term sometimes applied to denote the *pupa* or *chrysalis* stage in the metamorphosis (which see) of insects and other animals. The latter terms are now more generally employed in zoology. The name *aurelia*, also applied to the pupa-stage, was given to it for the same reason as the term *chrysalis*—namely, in allusion to the lustrous or shining appearance possessed by some pupæ. The nymph stage of metamorphosis may be either quiescent or active. The Butterflies, Beetles, and many other insects, exemplify cases in which the pupa is quiescent, being contained within a cocoon or pupa-case, or otherwise existing in a still condition. In other cases, exemplified by Crickets, Grasshoppers, Dragon-flies, &c. &c., the nymph appears as an actively moving creature, more or less closely resembling the perfect insect in form.

NYMPHÆACEÆ, or Water Lilies, a natural order of aquatic plants, as to the precise character of which botanists are not agreed, some, as Richard, maintaining that they are endogenous and monocotyledonous, the structure of the rhizome resembling that of endogens; while others, as Lindley, regard them as exogenous and dicotyledonous. They are generally large and vivacious, floating on the surface of the water, and having a stem which forms a subterraneous creeping shoot. The flowers are very large, solitary, with cylindrical peduncles as long as the petioles of the leaves; the perianth is coloured, petaloid, composed of a great number of folioli, arranged in several rows, and often inserted, as well as the stamens, in the lower part of the sides of the ovary; the outermost of these folioli seem to constitute a calyx, while those within form a kind of corolla. The stamens are very numerous; the anthers are turned towards the centre of the flower. The ovary is simple, covered almost throughout by the folioli of the perianth, and by the stamens; it is globular, with several cells, each containing a great number of ovules; the stigma is radiated, peltate, sessile. The fruit is globular, resembling externally a poppy capsule, indehiscent, fleshy within, divided into a great number of cells containing seeds immersed in a fleshy pulp. This order furnishes one of the best examples of the gradual passage of petals into stamens and of sepals into petals; the transition is so insensible that many intermediate bodies are neither precisely petals nor precisely stamens, but part of both. The principal genera of the order are *Euryale*, *Victoria*, *Nymphæa*, and *Nuphar*. *Victoria regia*, the Victoria Water-lily, is one of the most magnificent plants of which the knowledge has been obtained in recent times. It has a flower 15 inches in diameter, and leaves 6½ feet across. The Turks prepare a cooling drink from the leaves of *Nuphar luteum*, the Yellow Pond-lily, while its stems, which are bitter and astringent, have been prescribed in dysentery. The stems also contain a considerable quantity of starch, and after repeated washings may be safely used as food. The seeds, too, which taste like those of the poppy, may be used boiled or raw, like millet, and hence the Victoria is said to be called water-maize in South America. The *Euryale* also abounds in starch, and is a favourite food of the Indians and Chinese, while the negroes of Senegal roast the rhizomes of various species of *Nymphæa*, and eat them like potatoes. The rhizomes of *Nymphæa alba*, the White Water-lily, are said to be better than oak-galls for dyeing gray, and have long been advantageously used for tanning, and after due preparation furnish a tolerable sort of beer.

NYMPHS, youthful goddesses of the Greeks. Although styled Olympian divinities they were reckoned as of inferior rank to the other divinities who dwelt in Olympus. Begotten by Oceanus, or by Zeus and others, they preserve and nourish the woods, rivers, springs, and mountains. They are therefore distinguished according to their offices, as Oceanides, nymphs of the ocean; Nereides, nymphs of the Mediterranean; Leimoniades, nymphs of the meadows; Dryades or Hamadryades, wood-nymphs; Oreades or Orestiades, mountain-nymphs: these, dressed lightly, as huntresses, were the companions of Artemis (Diana); there were also Naiades, who presided over fountains, Potamides over rivers, Limniades over lakes, Nereides over seas, Napææ over vales, &c. They were also named from the places where they dwelt—Dodonian, Corycian, Nysæan, Dictæan, Nysiades, &c., for example. They are all females, holding a middle station between gods and mortals, and, without being immortal, they yet live longer than is permitted to man. The crow, says Hesiod,

lives nine times longer than a man, the stag four times longer than the crow, the raven three times longer than the stag, the phœnix nine times longer than the raven, and the nymphs nine times longer than the last. At their death the substance which they have supplied with nourishing moisture perishes also. This first notion of nourishment, which is supposed in the very idea of a nymph, seems to have given origin to the second representation of them as nurses of young children intrusted to their care. Thus they are said to have educated Bacchus, Æneas, and even Zeus. Their occupations and diversions are hunting, dancing, and female labours, to perform which they sometimes assemble in grottoes. Like other spirits of the elements, they possess the power of divination. The fountains of certain Naiades, moreover, possess the gift of inspiration. The poets and artists of antiquity represent them in the beauty of youth, clothed in light garments, sometimes in company with Artemis, and sometimes dancing with Aphrodite (Venus) and the fauns. The nymphs of the water are often represented merely with an urn or pitcher. From the great consequence which nymphs possessed as local goddesses frequent sacrifices were offered to them. Oil, milk, sheep, lambs, goats, wine, and flowers were sacrificed to them. The *nymphæa* (splendid houses near baths) were also sacred to them. Some nymphs were believed to preside over waters which inspired those who drank of them; whence all persons in a state of rapture or demoniac enthusiasm were spoken of as nymph-struck (*nympho-leptoi*). Adopting this idea Byron speaks of 'the nympholepsy of some fond despair.' This kind of affection was sometimes believed to come upon all those who accidentally saw a nymph.

NYSTAD, a town and seaport in Russia, in Finland, in the government of Åbo-Björneborg, and 36 miles N.W. of the town of Åbo, on the Gulf of Bothnia, where it has a good harbour. It has manufactures of linen, coarse woollens, and hosiery; and a considerable trade in linen, provisions, and timber. A peace was concluded between Russia and Sweden in this town in 1721, and bears its name. (See SWEDEN.) Pop. 3837.

O.

O, the fourth vowel and the fifteenth letter in the English alphabet, pronounced by pointing the lips, and forming an opening resembling the letter itself: the (so called) *open o* is pronounced with less pointed lips. In proportion as the lips are more opened the sound passes over into that of *a* (pronounced as in *father*). In proportion as they are less pointed, yet remain projected, the sound passes over into that of *u;* a consequence of which is, that *o*, in various dialects, passes over into *a* and *u*, also into *e* (pronounced as in *met*). The letter was introduced into European alphabets from the Phœnician, the corresponding letter in which was called *ayn*, meaning 'eye,' and represented by a rude outline of an eye, which in process of time became merely a circle with a dot in the centre, and finally a circle without the dot. The English language designates not less than four sounds by the character *o*, exemplified in the words *no, move, nor, not*, whilst there exist, on the other hand, other ways of denoting some of these sounds, as *au, eau*. The French indicate the sound *o* (pronounced as in *no*) by various signs. In German there is only a long and a short *o*, and no way of designating these sounds but by the letter itself; in Italian, an open and a close *o*. The case is very similar with the other languages of Western Europe. The Greeks, it is well known, had two different sounds for the long and the short *o*, the ο (*omicron*, or short *o*) and ω (*omega*, the long *o;* see OMEGA). In the article A it was said that *a* (as in *father*) was used more than any other letter to express various and even opposite emotions. The use of *o* is next in frequency to that of *a;* it is used particularly to express admiration, warning, pity, imploring; and, in general, as introductory to language expressive of great emotion. In all languages the interjection *O* is to be found: in Greek, ὦ, ὤ; in Latin, *O oh. O!* and *oh!* are the common forms in modern languages. The Romans change the Greek syllable *os* into *us;* and the Italians again made of *us* and *um*, *o* (see the article M); *bonus*, for instance, they made *bono:* the same change often takes place in Spanish. *O* in inscriptions signifies *optimus;* as, *I.*, or *D. O. M., Jovi*, or *Deo Optimo Maximo*, the frequent inscription on temples; *O. P., optimo principi. O* also is, on many coins, the initial of places and persons. As a numeral, *o'* among the Greeks signified 70, and *ο* 70,000; while ὦ signified 800, and ϡ 800,000; and in middle Latin, *o* signified 11; with a dash over it, 11,000.

O', in Irish proper names, a patronymic prefix corresponding to the Mac of the Highlands of Scotland; thus O'Connell means 'the son of Connell.' It is supposed to be a corruption of the Irish *ua* (Gaelic, *ogha*), meaning a grandson.

OAJACA, or OAXACA, a state of the Mexican Confederation, bounded on the W. by Guerrero, on the N. by Puebla and Vera Cruz, on the E. by Chiapas, and on the S. by the Pacific Ocean. Length, 270 miles along the shores of the Pacific; breadth at the widest part, 170 miles; area, 33,978 square miles. It is of uneven surface, and in many parts mountainous; but is one of the most beautiful and best-cultivated districts in Mexico. Its principal rivers are the Alvarado, which rises near the centre of the department, and, after a winding course, terminates in a lake in Vera Cruz; the Rio Grande and Verde, both of which fall into the Pacific near the western extremity of the department. At the eastern end are several smaller streams, most of which fall into the Gulf of Tehuantepec. The mines of silver and gold are not important. Among the other minerals are copper, quicksilver, iron, especially magnetic ironstone, sulphur, gypsum, &c. The country is subject to frequent earthquakes, and the coast exposed to sudden and violent storms, called Paragallos. The climate is agreeable and salubrious, and the soil remarkably fertile. Its productions are wheat, maize, barley, indigo, cochineal, cotton, sugar, honey, cocoa, coffee, plantains, pine-apples, bananas, and other fruits. The most important of these is cochineal. The imports are silk, woollen, and cotton goods, hardware, French and English porcelain, glass, dried fruits, brass, tin-plate, paper, hats, leather wares, &c. The only port is Huatulco. The inhabitants are chiefly Indians, of whom there are nineteen tribes, mostly speaking different languages. Pop. 744,222.

OAJACA, or OAXACA, a town in the Mexican Confederation, capital of the state of the same name,

near the left bank of the Verde, 218 miles S.S.E. of Mexico, 4800 feet above the sea. It is well built, of an oblong form, about 2 miles in length by 1¼ mile in breadth, including the suburbs, which are full of gardens and plantations of cochineal, for which this city is celebrated. It has a number of handsome and richly-decorated churches and monasteries, a town-house, and bishop's residence. The inhabitants are industrious, manufacturing silk, cotton, sugar, and chocolate. Pop. 26,228.

OAK (*Quercus*), a genus of trees belonging to the natural order Corylaceæ or Cupuliferæ, a genus which has from the remotest antiquity obtained a pre-eminence among trees, and has not unjustly been styled the monarch of the woods. Its great size, noble aspect, long duration, and the strength and durability of its wood, all contribute to enhance its importance. It was held sacred by the Greeks and Romans, and no less so by the ancient Gauls and Britons. The solemn services of the Druids were held under its shade; their mysteries were connected with it, and cutting the mistletoe from its trunk formed one of their most sacred rites. Among modern Britons, as furnishing in large part (though less now than formerly) the materials of their navy, it ranks as a national tree. The genus is one of the most extensive and varied that are to be found in the vegetable kingdom. It comprehends about 150 species, inhabiting chiefly the temperate parts of the northern hemisphere. About 100 species have been introduced into Great Britain. Some of these species are trees of great magnitude, while others are mere shrubs not exceeding the height of 2 feet. Some species are evergreen, but the greater number are deciduous. The fruit in all the species is the well-known acorn, remarkable for its uniformity in size and shape. The most celebrated tree of the tribe is the *Quercus Robur*, the British oak, indigenous not only in Britain, but in many parts of Europe. It comprehends many varieties, two of which are so distinct that botanists frequently class them as species—*Quercus Robur pedunculata* and *Quercus Robur sessiliflora*. The former yields the acorn on fruit-stalks, the latter bears both flower and acorn close to the branch without fruit-stalk. The former produces the best timber. From the earliest accounts we have of British oaks it appears that the forests were chiefly valued on account of the acorns they produced, which were generally consumed in feeding swine and other domestic animals, while in years of scarcity they were used as human food. Most of the counties in England possess some remarkable trees of this species, and generally they are 'full of story, and haunted by the recollections of the great spirits of past ages.' In Norfolk stands the celebrated Winfarthing oak, for the most part a ruin, but still producing foliage and acorns. It is said to have been called 'the old oak' in the time of William the Conqueror, and its age is believed to be 1500 years. Attached to the tree is a brass plate bearing an inscription dated 1820, and stating the circumference of the tree at the extremity of the roots to be 70 feet, and in the middle 40 feet. The 'king oak' at Windsor forest is said to have been a favourite tree of William the Conqueror. It measures 26 feet in circumference at 3 feet from the ground. The Shelton oak, near Shrewsbury, is about 26 feet in girth at breast-height, It is celebrated from having been mounted by Owen Glendower on the 21st of June, 1403, that he might obtain a view of the battle of Shrewsbury. Some districts of Scotland contain a considerable extent of valuable oak forest, but the dimensions of the best specimens fall short of those of English growth. In Roxburghshire two fine trees stand on the property of the Marquis of Lothian; one called the 'king of the woods,' and the other the 'capon tree.' The Mossy-cupped or Turkey Oak (*Quercus cerris*) is a native of the middle and south of Europe and of the west of Asia. It was introduced into Britain in 1735. It is a tree of an elegant appearance, as hardy as the common oak, of much faster growth, and grows vigorously even in a very poor soil. The acorns are small, and have rough prickly cups. There are several varieties of this species. The Holly Holm, or Common Evergreen Oak (*Quercus ilex*), is a native of the south of Europe and north of Africa. It is the commonest evergreen in the neighbourhood of Rome and Florence, and it has been cultivated in Britain from a very remote period. The foliage is abundant, of a rich dark green, having a fine polish, glossy above and slightly downy beneath. The Italian Oak (*Quercus Æsculus*) is a species found growing naturally in Italy and Spain. The leaves are smooth and deeply sinuated, like winged leaves. The acorns are long and slender, the cups rough and a little prickly, sitting close to the branches. This species is that which was considered by the Romans sacred to Jupiter, and out of the shoots and leaves of which they made their civic crowns. The Valonian Oak (*Quercus ægilops*) is a native of the Levant and of Spain. The leaves are oval, deeply serrate, with most of the teeth turning backwards, and terminating in acute points. They are about 3 inches long, and almost 2 broad, stiff, of a pale green colour, and downy on the under side. The acorns are almost covered by the cups, which have ligneous scales, and are used by dyers and tanners. The Kermes Oak (*Quercus coccifera*) is a common tree all along the Mediterranean coast. It is of small growth, seldom rising above 12 feet. The leaves are indented on their edges, which are armed with prickles like those of the holly. The trunk is feathered to the bottom, which gives it the appearance of a bushy shrub. From this tree are gathered the kermes from which the ancients obtained a beautiful red dye, and which are still employed by the people of Barbary to dye their round scarlet caps so much used in the Levant. (See COCCUS.) The Cork Oak (*Quercus suber*) is found in abundance in Portugal, Spain, Italy, the southern parts of France, and in the Barbary states. It rarely exceeds 40 feet in height, and is from 2 to 3 feet in diameter. The outer bark of this tree, which constitutes cork, is unusually large, and when removed is speedily renewed by the liber or inner bark. This process, so far from injuring, is said to benefit the tree and prolong its life. (See CORK.) The White Oak (*Quercus alba*) is a native of the United States of America and of parts of Canada. It rises to the height of 70 or 80 feet, and has a diameter of from 6 to 7 feet. The bark is of a grayish white colour, with large black spots. The timber is of a reddish hue, and though not so durable for ship-building as the British oak, has the advantage of a superior elasticity, which enables it to be bent in a shorter time into ship timber. The Red Oak (*Quercus rubra*) is found in most parts of North America, but flourishes best in the north of the United States and in Canada. It is a tall tree, being of about the same height as the white oak. The leaves are 6 inches long, and are of a bright green colour till late in autumn, or even till Christmas if frost does not set in early; but in winter they change their colour to red. The timber is reddish, and of a coarse texture. The bark is used for tanning. The Chestnut Oak (*Quercus Prinus*) includes several varieties, which are all found in the middle and north states of North America. The wood is small grained, and very serviceable in the arts. The bark is gray and scaly. The acorns are large, with short cups. The Live Oak (*Quercus virens*) is found exclusively in the maritime parts of Florida and lower Louisiana

in the United States. The influence of the sea air seems necessary to its existence; for it is seldom seen in forests even at so short a distance as 15 or 20 miles from the shore. It is most abundant on the islands and round the bays of the mainland. The most common height of this oak is from 40 to 45 feet, and its diameter is from 1 to 2 feet. The timber is of a yellowish colour, very heavy and compact, and is much esteemed for ship-building (especially for making *knees*), being more durable than the best white oak. This tree is fast disappearing, owing to the extent of the demand for it, and also to the fact of the land on which it grows being cleared for cotton. Among the other American oaks may be mentioned the Willow Oak (*Quercus Phellos*), the Water Oak (*Quercus aquatica*), the Downy Black Oak (*Quercus triloba*), the Barren Black Oak, or Black Jack of Virginia (*Quercus nigra*), and the Black or Quercitron Oak (*Quercus tinctoria*), one of the largest of the American oaks, and very valuable for its timber and bark. The Dyer's Oak (*Quercus infectoria*) is that from which the nut-galls of commerce are produced, although the gall-nut (see GALLS) is common on almost all the other species of the tribe. This species is a shrub seldom exceeding 6 feet in height, and is very common in Asia Minor. It is cultivated in France as a garden plant, and grows well in the open air.

OAKHAM, or OKEHAM, a town in England, the chief town of the county of Rutland, pleasantly situated in the vale of Catmos, 85 miles N.N.W. London. It has a fine old church, with a tower, terminating in a lofty spire; national model schools, in a handsome Elizabethan building; a free grammar-school, an old castle, partly fitted up as a county hall; a handsome agricultural hall and news-room; and manufactures of silk shag for hats. Pop. 3204.

OAK LAPPET MOTH. See MOTHS.

OAKUM, the substance into which old ropes are reduced when they are untwisted, loosened, and drawn asunder. It is principally used in caulking the seams, tree-nails, and bends of a ship, for stopping or preventing leaks.

OAR, a long piece of timber, flat at one end and round or square at the other, used to make a vessel advance upon the water. The flat part, which is dipped into the water, is called the *blade*, and that which is within the board is termed the *loom*, whose extremity, being small enough to be grasped by the rowers, is called the *handle*. To push the boat or vessel forwards by means of this instrument, the rowers sit with their faces towards the stern, and, dipping the oar in the water, pull the handle forward, so that the blade, at the same time, may move aft in the water. But since the blade cannot be so moved without resistance from the water, this impulsion is the same as if the water were to strike the blade from the stern towards the head: the vessel is therefore necessarily moved according to the direction. Hence it follows that she will advance with the greater rapidity the more the vigour, length, and number of the strokes are increased; consequently, an oar acts upon the side of a boat or vessel like a lever of the second class, whose fulcrum is the water, the weight being the vessel and its contents.

OASIS (Coptic, an inhabited place), a fertile spot, situated in the midst of an uninhabitable desert, especially the deserts of Northern Africa and Arabia; the name is also applied to a cluster of verdant spots. They serve as stopping-places for the caravans, and often contain villages. Their fertility and habitability depend on their supplies of water. The oases of Northern Africa are either river valleys, the waters of which are for the most part underground, or depressions surrounded by short ranges of hills, from which small brooks descend, sometimes forming a lake in the centre; or spots where springs arise from the base of neighbouring eminences. The most usual vegetable productions are dates, palms, and gum acacias. Among the larger oases are Tuat, Tibesti, Bilma, Air, El-hadh, Aderer, and Wadi-Draa. The district of Fezzan, in the south of Tripoli, is also nothing else than a large oasis. In ancient times the most celebrated oasis was that to the west of Egypt, containing the temple of Jupiter Ammon, now called the Oasis of Siwah.

OAT (*Avena*), a genus of grasses belonging to the division with two-flowered spikelets; whose glumes are as long as their florets, and whose pales are furnished with an awn both twisted and kneed. The great distinguishing features of the genus, strictly limited, are large membranous glumes, and firm, almost cartilaginous pales. The awn in oats often wholly disappears under cultivation. Botanists enumerate a great number of species (between fifty and sixty) of this genus, but the greater part are of no general interest. The most important (being the only cultivated) species, are the following:—1. *Avena sativa* (the Common Oat), an annual with a perfectly smooth herbage, and an open panicle of flowers, spreading equally all round. Each spikelet contains two florets, which are quite bald, shorter than the glumes, and adherent to the grain when ripe. Of these florets one only is bearded, even when a third is present, which is sometimes the case. The native country of the common oat is entirely unknown, although it has been imagined that it may have originated in Mesopotamia or Persia, the source of so many of our cultivated productions, and a kind of oat was actually found growing wild in the former region by Colonel Chesney when exploring the course of the Euphrates. 2. *Avena nuda* (Naked Oat, Pilcorn, or Peelcorn), a species differing little from the common oat, except in its grain being naked, and its spikelets commonly three-flowered. It is probably a mere variety produced by cultivation. 3. *Avena orientalis* (Tartarian Oat), an annual with a perfectly smooth foliage, and a close panicle of flowers turned towards one side. It differs from the common oat principally in its more compact, one-sided panicle, and larger glumes. 4. *Avena brevis* (Short Oat), an annual which differs from the preceding chiefly in the shortness of its glumes, from which quality it gets its name. The Germans admit this among their native plants, and say that it grows wild among corn. It is cultivated in mountainous districts of Europe, because it ripens quickly; as in those of Auvergne and Forez in France, where the country people call it *pieds de mouche*, or 'fly's legs,' because of the appearance of the dark awns which project beyond the glumes. It is said to be a good green crop, growing 4 feet high and more very quickly. 5. *Avena* or *Danthonia strigosa* (Bristle-pointed Oat), an annual with smooth herbage, except near the root, where it is minutely downy, and a loose panicle of flowers turned towards one side. It differs from the common oat in having smaller flowers, in having a pair of bent awns on each spikelet, instead of only one awn, and in having the side lobes of the pales so long that they resemble supplemental awns, and have been actually so described. It is found wild in abundance in corn fields all over Europe, but on account of the smallness of its grain is unfit for cultivation, except on poor mountainous places where nothing better may be had. It has, however, been much improved by the Germans. Besides these five species of cultivated oats there are numerous uncultivated species, the commonest of which is that called Haver, which infests corn-fields, and is apt to be mixed with barley. It is known by its florets being covered with

long coarse brown hairs, and bearing harsh crooked awns, which have a powerful hygrometric action.

The oat is cultivated extensively in all temperate climates, and is especially adapted to those having a moist atmosphere and a low and equal range of summer temperature. An insular position is the most favourable, and hence we find that the cultivation of oats has been pursued immemorially in the British Islands, especially in Scotland, Ireland, and the north and west of England. The climate and soil of Scotland particularly are very well adapted for this crop, and Scotch oats are superior to all others in quality of grain. The cultivated species of oats are subdivided into a large number of varieties, which are distinguished from each other by colour, size, form of seeds, quality of the straw, period of ripening, liability to shed their seeds in high winds, adaptation to particular soils and climates, and other characteristics. There are three principal groups of oats easily distinguishable by colour; white, black, and gray or dun. White oats are separable into two principal varieties, the late and the early; and these again into several sub-varieties, characterized by certain peculiarities of growth. Early oats are best adapted for the higher class of soils, as the greater yield per acre more than compensates the inferiority of the straw. Their earliness renders them very suitable for late districts; but the liability of some to shed their seeds in high winds renders their cultivation in high-lying and exposed situations extremely hazardous. Late or common oats, as they are more generally termed in Scotland, are distinguished from the early variety by late ripening, thicker husk, and less meal. Early oats are of better quality than late oats, but late oats have a more vigorous constitution, and are better able to resist the effects of atmospheric changes, such as rains or droughts, and when ripe are less liable to shed their seed in high winds. They can likewise be cultivated with greater success than the earlier varieties on inferior soils, and soils of a strong clayey nature. Black oats are of two kinds, the one the Tartarian, having the ear only on one side of the straw; and the other the old or common black, with black seeds, but having a spreading ear similar to the white varieties. Dun oats are to all appearance hybrids between the last mentioned and one or other of the white sorts. The great majority of the cultivated varieties of oats belong to the species *Avena sativa* and to the white group. One of the most important of these varieties is the Potato-oat, which was for a long time after its introduction considered very superior to all other sorts, both for the quality and quantity of grain produced, but the cultivation of which has of late years greatly decreased on clays and secondary soils, in consequence of its increasing liability to become tulip-rooted and sedge-leaved. It has a great tendency to shed its seeds when fully ripe, which sometimes occasions considerable loss. The original stock of the potato-oat is said to have been discovered in 1788 in a field in Cumberland. The sandy oat is of more recent origin than the previous variety, is better adapted than it for clay soils, and is not so liable to shed its seeds. The Flemish oat is still better adapted for clayey soils than the sandy, which on such soils it has generally superseded. All these are early varieties, and among the other early varieties of the *Avena sativa*, the best for general cultivation are the Scotch and English Berlie, Hopetoun, Early Angus, Sherriff, Old Poland, Barbachlaw and Kildrummy. Of the late varieties the Late Angus Oat is the best for growing upon all kinds of clay land, situated in an early climate, and is the common oat of the north of Scotland. Among the other oats of this group are the Blainslie Oat, which is the common oat of the south of Scotland, and the Drummond, which is the most common white oat of the central parts of Scotland. The common or old black oat is a very old variety of the *Avena sativa*, at one time much cultivated in the Highlands of Scotland. Three species of the *Avena orientalis* are cultivated, the Common White Tartarian, the Early White Tartarian, and the Early Black Tartarian. The last is now a well-known variety, and is pretty generally cultivated in districts where peat and marshy soils abound. It produces a very superior quality of meal, but in consequence of the practical difficulty connected with the entire separation of the husk from the meal is frequently injured in appearance by the presence of black specks derived from the former, which create a prejudice against it among those not acquainted with the cause. The *Avena brevis* is not cultivated in this country. The *Avena strigosa* or Bristle-pointed Oat has no varieties. It is common both in England and Scotland, and in the former country is sometimes cultivated for the sake of the straw, which is made into hay, and given to riding horses. It is sometimes confounded with the wild oat, but is distinguished by its shorter straw and one-sided ear, the ear of the wild oat being spreading.

OATES, Titus, the well-known perjurer and informer, who contrived the 'Popish Plot,' born about 1620; died in 1705. He was the son of an Anabaptist preacher, and was educated at Merchant Tailors' School, whence he removed to Cambridge, and afterwards took orders. In 1677 he pretended a conversion to the Roman Catholic religion, and was admitted into the Society of Jesuits; but within the same year was expelled with ignominy from two Jesuit colleges with which he successively connected himself, that of the English Jesuits at Valladolid, and the College of St. Omer. He subsequently declared himself a Protestant, and in 1678, in conjunction with one Dr. Tonge (also spelled *Teonge* and *Tongue*), gave information of a pretended popish plot for the destruction of the Protestant religion, and falsely accused the majority of the leading Catholics in England of being concerned in the conspiracy. So much alarm was created by these allegations that the people were disposed to believe anything that Oates asserted, and for two years his statements were received without question. He was rewarded with a pension and lodged for safety at the Palace of Whitehall. Numerous Catholics were condemned and executed on his information, till at last the popular frenzy began to abate, and the popular odium was directed against the informer himself, instead of those whom he accused. Before the close of Charles II.'s reign the Duke of York instituted a civil suit against Oates for defamation, and obtained damages to the amount of £100,000, which Oates being unable to pay, was thrown into prison as a debtor. About the same time two indictments for perjury were drawn up against him by a Middlesex grand-jury, on both of which he was tried and convicted in the beginning of the reign of James II. (1685). He was sentenced to pay a fine of 2000 marks, to be stripped of his clerical habit, pilloried in Palace Yard, led round Westminster Hall with an inscription over his head, again pilloried in front of the Royal Exchange, to be whipped from Aldgate to Newgate, and, after an interval of two days, from Newgate to Tyburn, to be imprisoned for life, and to stand in the pillory five times every year in different parts of the kingdom. The first stages of the punishment were inflicted with their full rigour. While standing in the pillory for the first time he was nearly killed by the fury of the people, and the whipping which he afterwards suffered was so severe that he was not expected to recover. At the Revolution

the current of popular prejudice again flowing in his favour he was released, and again had a pension granted to him. In 1698 he sought to be restored to the congregation of Anabaptists, to which he had at first belonged; but in the course of a few months he was excluded as a hypocrite and disorderly person. Oates is introduced by Sir Walter Scott in Peveril of the Peak, where he is made to speak a peculiar dialect. See POPISH PLOT.

OATH (in Latin, *jusjurandum*, *juramentum*), a solemn assertion or promise, with the invocation of God to be a witness of the truth of what we say; hence the end of the judicial oath, 'So help me God.' Such an invocation is of very early origin, it being the most natural and solemn confirmation of the truth of what is said. The obligation of an oath is variously considered by different religions and sects; some consider oaths binding even if the promise be in itself criminal, or has been extorted by extreme fear or by fraud. Catholics believe that the pope has authority to release a person from any obligation into which he has entered, even when he has bound himself by an oath. In former times, when all the principal European powers were Catholic, this gave him fearful power. In the middle ages oaths were enormously abused; they were taken freely, but often kept indifferently. A common superstition supposed only those oaths to be binding which were taken under circumstances of peculiar sanctity. The oath which Harold of England is said to have sworn to William of Normandy when he fell into the latter's power, binding him to aid William in ascending the English throne, is a good illustration of what was then conceived as to the nature of an oath. Harold took the oath as William required, laying his hand on an altar on which lay some reliquaries of the common kind, which he accordingly esteemed to have no binding effect; but when the oath had been taken William removed the altar, a cloth of gold covering which revealed the relics of some of the most revered martyrs, at the sight of which, it is said, Harold turned pale, being well aware of the awful sanctity that was given to his oath by this device. The oath, if it was ever taken, was certainly not kept; but the nature of the subterfuge to which William is described as resorting is sufficient to indicate the character of the superstition then current. It is, however, a superstition by no means confined to the middle ages, but found at all times in persons of narrow and unenlightened conscience. The practice of exacting oaths as a security for the faithful performance of duties, fidelity in the discharge of which is essential to the well-being of a community, is common everywhere. Some Christian sects, however, founding upon the injunction of Christ in Matt. v. 34, hold the taking of an oath to be wrong in all circumstances, however solemn. The chief sects that adhere to this principle are the Moravians, Quakers, and Separatists. Mohammedans do not make use of oaths in their judicial proceedings.

By the law of England (applying also to Scotland) an oath of allegiance must be taken by the chief officers of state, including privy-councillors, members of either house of Parliament, certain English and Irish judges, and in Scotland by the judges of the supreme court, sheriffs, and county and burgh justices, and by clergymen in both countries. The present form of the oath is that prescribed by 31 and 32 Vict. cap. lxxii. (1868), and is intended as a substitute for the oaths of allegiance, supremacy, and abjuration formerly exacted. The chief officers of state are required to take in addition an official oath well and truly to serve the sovereign in the office upon which they are entering, and judges to take a judicial oath by which they engage well and truly to serve the sovereign, and 'to do right to all manner of people after the laws and usages of this realm, without fear or favour, affection or ill-will.' The prescribed form of each of these two oaths is given in the same act. Jurors are required to take an oath that they will perform their functions honestly, and witnesses must take an oath before giving testimony. According to the English practice jurors and witnesses, after being sworn, are required to kiss the New Testament; in Scotland the witness while being sworn holds up his right hand, but does not kiss the book. Witnesses are, however, allowed to take the oath in any form which they consider binding on their conscience. A Jew or a Mohammedan is not required to take it in the form in which it is usually taken by Christians. A Jew is sworn on the Pentateuch, and a Mohammedan on the Koran. But in all these cases those who have conscientious objections to the taking of an oath are allowed to substitute an affirmation or solemn promise and declaration. In the case of promissory oaths provision is made for this in the act already cited (cl. 11), and in the case of oaths administered to witnesses by various enactments, the last and most comprehensive of which is 32 and 35 Vict. cap. lxviii. cl. 4, as amended by 33 and 34 Vict. cap. xlix. The former act decrees that 'if any person called to give evidence in any court of justice, whether in a civil or criminal proceeding, shall object to take an oath, or shall be objected to as incompetent to take an oath, such person shall, if the presiding judge is satisfied that the taking of an oath would have no binding effect on his conscience, make the following promise and declaration: 'I solemnly promise and declare that the evidence given by me to the court shall be the truth, the whole truth, and nothing but the truth.'' And the latter act explains that the terms 'court of justice' and 'presiding judge' in the previous act 'shall be deemed to include any person or persons having by law authority to administer an oath for the taking of evidence.' These laws apply only to England, a similar provision having previously been made for Scotland by 18 and 19 Vict. cap. xxv. Persons who wilfully and corruptly give false evidence under such a declaration are liable to be indicted and convicted for perjury just as if they had given the evidence upon oath. By act 5 and 6 William IV. cap. lxii. all unnecessary and extra-judicial oaths were abolished, and any justice of the peace, notary-public, or other officer authorized to administer an oath, is empowered to take a voluntary declaration instead. Any person who wilfully makes a false declaration in such circumstances is guilty of a misdemeanour.

OAXACA. See OAJACA.

OBADIAH, or ABDIAS, one of the twelve minor prophets, who foretells the speedy ruin of the Edomites. The prophecy was probably uttered during the period which elapsed between the fall of Jerusalem (586 B.C.) and the conquest of Edom by Nebuchadnezzar (583 B.C.).

OBAN, a seaport town in Scotland, in the county of Argyle, 20 miles north-west of Inveraray, in the form of a crescent bending round the Bay of Oban, which forms a deep and well protected harbour. It has an extensive carrying-trade with the Clyde, and has since 1881 been the terminus of a branch line connecting it with the Caledonian Railway system. Near it are the interesting ruins of the royal palace of Dunstaffnage and of the castle of Dunolly. Of late years it has become a favourite place of resort for summer visitors. It unites with Ayr, Campbelton, Inveraray, and Irvine in sending a member to Parliament. Pop. in 1871, 2426; in 1881, 4046.

OBE, OBI, or OBY, a river, Siberia, which, rising in the Altai Mountains, pursues a very circuitous

course north-west to Samarova, and there dividing, flows north in a double channel to the Gulf of Obe. Its chief tributaries are the Irtish, Tobol, Tom, and Tchulim. Its course is estimated at 2000 miles.

OBEAH, or OBI, a species of witchcraft practised among negroes, the apprehension of which, operating upon their superstitious fears, is frequently attended with disease and death.

OBEID, EL, an African town, seat of the Egyptian governor of Kordofan, 220 miles south-west of Khartoom. The inhabitants weave beautiful fabrics from palm-fibre and make pretty filigree work in silver. They also carry on a large trade in gum, ivory, gold, &c. Pop. 12,000.

OBELISK (Greek, *obelos* and *obeliskos*, both literally signifying a spit or pointed instrument of any kind, and hence a pointed pillar). Obelisks belong to the oldest and most simple monuments of Egyptian architecture, and are high four-sided pillars, diminishing as they ascend, and terminating in a small pyramid called the pyramidion or cap. They seem to have been peculiar to Egypt, and although two structures resembling obelisks, and the apex of a third, have been discovered in Assyria, these differ from the true Egyptian obelisk in this respect, that their summits, instead of being of a pyramidal form, are step-shaped. The obelisks of ancient Rome were not the work of Roman hands, but were brought there from Egypt at great expense. In more recent times several other obelisks have been brought from Egypt to adorn other European capitals. The Egyptian hieroglyphic name of obelisks is *tekhen*. They are all monoliths, and vary in height from a few inches to above a hundred feet. The highest ever erected were those set up at Heliopolis by Sesortosis, two in number, each 180 feet in height. They are mostly of red granite, or rather syenite, from the quarry of Syene in Upper Egypt. For the most part they bear hieroglyphical inscriptions recording the names and exploits of Egyptian kings, whence they are called in Coptic by a name signifying 'written columns.' Those which are without such inscriptions may probably be regarded as unfinished. The sides of some of the obelisks are slightly convex, the intention of which is to obviate the effect of the play of light on polished granite surfaces in making them appear concave. In the obelisk of Luxor, now in the Place de la Concorde at Paris, the convexity of the sides at the middle amounts to 16 lines, yet their surfaces appear perfectly plane. An obelisk still lying in an unfinished state in the quarry of Syene shows the way in which they were made. The obelisk was cut out in the solid rock, and polished on three sides before the fourth side was disengaged. A deep fissure was then made along the underside where the separation was to be made, and wooden wedges introduced into it, which, being frequently moistened, expanded and gradually effected the separation without any shock. When thus disengaged from the quarry the obelisks were conveyed on rafts to their destination during the inundations of the Nile, or where this means did not serve, were laid on a rude kind of carriage made of logs, and dragged over the ground by long trains of men or animals. On reaching the place where they were to be erected the sculptors set to work to engrave on them the inscriptions they were intended to bear, a work of extreme labour on account of the hardness of the material. The inscriptions are read perpendicularly. Sometimes there is only one, and sometimes more than one column of inscriptions on each side. The engraving being finished, the obelisks were erected on their pedestals, which are quadrangular blocks of stone of considerably larger area than the base of the obelisk, and having a socket in which the lower end of the obelisk is inserted. Inclined planes and other mechanical apparatus were the means by which they were erected. Knowledge of these matters is derived from inscriptions on the pedestals, on which are also to be seen designs of the elevating apparatus which the ancient Egyptians made use of. According to Herodotus obelisks were first erected in honour of the sun-god (Phra or Ra), and were intended to represent its rays. It is well known that among the ancient Egyptians they made a principal ornament of the open squares and the temples, before the large gates of which, during the period of the New Monarchy, which begins with the eighteenth dynasty, two or more were commonly placed. For this purpose they used only obelisks of considerable height. The oldest obelisks that have been discovered belong to the fourth dynasty, but those of great antiquity are all small. Of large obelisks the oldest is that which was erected by Sesortosis, Sesortesen, or Osortesen, a king of the twelfth dynasty, at On, afterwards called Heliopolis. Its date is earlier than 2000 B.C. Large numbers of obelisks were erected by the rulers of the eighteenth dynasty, that which expelled the Hyksos or shepherd kings. To this dynasty belong nearly all those which are still to be seen at Rome, and the one at Paris, which is 72 feet in height. When Cambyses invaded and overran Egypt he overthrew a large number of obelisks, and caused others to be erected. The Ptolemies confined themselves to removing to other localities those which already existed, and under the Roman domination many were brought to various cities of the Roman Empire (Rome itself, Arles, Constantinople, Beneventum, Florence, Catania, &c.) by the emperors, while the Roman prefects in many cases had new ones extracted from the quarries of Syene, and had their own names inscribed on them in hieroglyphics, accompanied by exaggerated panegyrics on their achievements. A large number of obelisks still exist in Egypt, some erect and some prostrate. Father Sicard, who travelled in Egypt in the beginning of the eighteenth century, counted eighteen obelisks still standing—two at Alexandria, one at Heliopolis, one in the Nome Arsinoïtes, ten at Thebes, and four at Philæ. All those which he mentions have not been discovered, but new ones have been found broken and buried in the sand. Two obelisks in Alexandria, known as Cleopatra's Needles, were offered by Mehemet Ali in 1820 to England and France. The French chose instead the obelisk of Luxor already mentioned, which was removed to its present site in 1833. It is in excellent preservation, except for two slight defects in the pyramidion and at the base. Its height in the socket is rather more than 72 feet. The English allowed theirs to continue lying prostrate in the sand for nearly sixty years; and its removal was at last due to the public spirit of two private gentlemen, Mr. Erasmus Wilson and Mr. John Dixon. It was conveyed to London with no little difficulty in 1877–78, and on the 12th of Sept. 1878, it was erected on the Thames embankment. Its height is 68 feet 5½ in.; breadth at the base, 7 feet 10½ in. by 7 feet 5 in.; its weight above 186 tons. (See CLEOPATRA'S NEEDLES in Supp.) Most of the other remarkable obelisks are now at Rome. The first brought to that city was one that Augustus caused to be transferred there from Heliopolis. It stood in the Circus Maximus, and was of great antiquity. At the sack of Rome by the barbarians it was thrown down, and remained broken in three pieces amidst the rubbish, until in 1589 Sixtus V. had it restored by the architect Domenico Fontana, and placed near the church Madonna del Popolo. It is 75 feet in height exclusive of the pedestal, but was taller before its restoration. Under Caligula another

large obelisk was brought from Heliopolis to Rome, and placed in the Circus Vaticanus. It has stood since 1586 before St. Peter's Church; it is without hieroglyphics, and measures 85 feet in height. It is the only one in Rome which has remained entire. Its weight is estimated at 10,000 cwts. Claudius had two obelisks brought from Egypt, which stood before the entrance of the mausoleum of Augustus, and one of which was restored in 1567, and placed near the church of Santa Maria Maggiore. Caracalla also procured an Egyptian obelisk for his circus and for the Appian Way. The largest obelisk (probably erected by Thothmes III.) was placed by the Emperor Constantius II. in the Circus Maximus at Rome. In the fifth century it was thrown down by the barbarians, and lay in pieces upon the ground until Sixtus V. in 1588 had it raised upon the square before St. John's Church of the Lateran, thence called the *Lateran obelisk*. It is beautifully adorned with sculpture. Its weight is more than 13,000 cwts.; its height, exclusive of the pedestal, 105 feet. Several others have been erected by succeeding popes. See Zoega, De origine et usu obeliscorum (Rome, 1797); Ungarelli, Interpretatio obeliscorum urbis (Rome, 1842); L'hote, Notice historique sur les obélisques (Paris, 1836); and Birch, Notes upon Obelisks in the Museum of Classical Antiquities (vol. ii.)

OBERLIN, JOHANN FRIEDRICH, Protestant pastor of Waldbach in the Ban de la Roche, Alsace, was born at Strasburg in 1740, and was carefully educated by his parents. His own inclination would have led him to become a soldier, but he was induced by his father to study for the ministry at the University of Strasburg. He afterwards spent some time as a private tutor, and in 1766 had accepted of a chaplaincy in a French regiment, when the pastor of Waldbach in the Ban de la Roche, or, as it is called in German, Steinthal in Alsace, invited him to become his successor. He at once accepted, and commenced his duties in 1767. Oberlin found his parish in a very wretched state, not so much, however, in a moral and religious as in a physical and secular point of view. The want of roads almost precluded his parishioners from any kind of communication with their neighbours. Calling them together, he proposed to make a road to Strasburg. For this purpose rocks had to be blasted, and a bridge to be built over the Bruche at Rothau. The meeting at once declared the thing to be impossible; but Oberlin's mind was made up, and taking up his pick-axe he at once set to work. Many of the peasants joined him, and before three years had elapsed the road and bridge were completed. The happiest results soon followed, a regular trade springing up almost immediately between the secluded Steinthal and the wealthy and populous capital of Alsace. His next object was to improve the state of agriculture in the district, and in this he succeeded so well, that before the end of the century the place which, before Oberlin came to reside there, had provided only a wretched subsistence for about a hundred families, sustained a population of 5000. When agriculture no longer sufficed for the wants of the inhabitants, he introduced straw-plaiting, cotton-spinning, and finally weaving. This last, however, only succeeded till machines were introduced into the neighbouring villages; and the inhabitants were only delivered from the distress which ensued on the failure of this branch of industry by the removal of the ribbon manufacture of Legrand from Basel to Ban de la Roche. So well was his character understood and appreciated, that even the storms of the revolution passed over without seriously affecting either him or his flock, and he was even able to afford an asylum to others. Indeed so visibly were his merits impressed on every part of his parish, that even government found it impossible to overlook them, and public societies honoured themselves by bearing testimony to their importance. Louis XVIII. presented him with the decoration of the Legion of Honour, and the Agricultural Society of Paris awarded him a gold medal. He died in 1826.

OBERON, king of the fairies and husband of Titania, appears as Roi du Royaume de la Féerie in the old French poem of Huon di Villeneuve, called Huon di Bordeaux Pair de France. This work was afterwards transformed into a popular romance in prose, descriptive of the time of Charlemagne and his Paladins. The name Oberon is said to be written for Auberon, which stands for the more ancient Alberon, and is equivalent to the German *Alberich*, that is, Elfin-king. From the French Chaucer and Spencer, as well as Shakspere in his Midsummer Night's Dream, have derived their Oberon, and from an extract of the French romance, inserted by the Count di Tressan in the Bibliothèque Universelle des Romans, Wieland derived part of the materials for his Oberon. Planche's text for Weber's Opera of Oberon is derived from Wieland. Oberon is said to be derived originally from the Scandinavian mythology.

OBESITY. See CORPULENCE.

OBIT, in the Roman Catholic Church, a periodical, usually an annual, religious service, founded for the repose of the soul of a deceased person, and for which a stated remuneration was left. In former times grotesque customs were frequently associated with the performance of obits. A canon of Evreux is said to have established an obit to his own memory during the performance of which a mortuary cloth was spread in the choir of the church, with a bottle of wine placed at each corner and a fifth in the middle. These were discussed by the choristers after the service, when the virtues of the deceased were duly celebrated. The institution of obits is said to be an ancient one in the church. It is attributed to the practice in the primitive church of commemorating the martyrs, on the anniversary of their deaths. During the period of prosperity following the persecutions others became ambitious of like honours, and similar commemorations were extended to benefactors of the church, and to private individuals by friends and relatives. A similar institution, called the *commendation of benefactors*, is observed in the English universities.

OBJECT. The term object, in philosophy, is the correlative of subject. These terms are in very common use among modern philosophers to represent the distinction between the mind, or agent, or conscious being, or whatsoever it is conceived to be that thinks (the subject), and that, whatsoever it is, that is thought of (the object). The terms subject and object do not belong, in this sense, to ancient philosophy. Subject, or the equivalent Greek term *hypokeimenon*, was employed by Aristotle to signify the supposed passive substance to which the form of an object is applied, or by generalization in a sense equivalent to the modern substance. The distinction between the two indispensable terms of thought or knowledge were represented by the Greeks by the terms *nous* and *noēton*, the knower and the knowable, the mind considered as perceptive or intelligent, and the things perceived and known by it. The terms subject and object were first introduced in their modern relation in scholastic philosophy, and the distinction between them was at first merely logical; thus the mind in the act of forming a particular thought or conception was called the subject of that thought, while that to which the thought referred was called the object. The mind might thus be its own object. Modern philo-

sophers have developed this distinction so that the agent in thought is permanently styled the subject, and all that pertains to it subjective; while that about which it is occupied is the object, and that which pertains to it is objective. When the distinction takes this form the question inevitably arises whether the distinction between subject and object is a real or only a nominal one. To this question various philosophers give different answers. To answer it in the sense of Descartes or of Kant would be not to define the terms but to unfold the principles of their philosophy. This is, in fact, the central question of modern philosophy, and is more fully dealt with in other articles. See METAPHYSICS, PHILOSOPHY, &c.

Object, in grammar, is used in a logical sense to designate the relation of a noun or pronoun to a verb expressing action, when the action represented by the verb is suffered by or performed on or to the thing represented by the noun or pronoun. A noun or pronoun bearing this relation to a verb is said to be in the objective case. Objective is the correlative of nominative, the subject of the verb, a noun or pronoun, representing the performer of the action, being said to be in the nominative case.

OBJECT-GLASS, or OBJECTIVE, the lens or combination of lenses which in a telescope or microscope (which see) forms the image of an object viewed by means of the 'eye-piece.'

OBJECTIVE. See OBJECT.

OBLATI, or OBLATES, a name given from an early period in the Roman Catholic Church to children dedicated by their parents at the altar to God, or to the service of the church. A congregation of nuns of this name was founded in 1425 by St. Frances under the rule of St. Benedict. Women of noble birth who had fallen into poverty, and were placed by the king in a convent without taking vows, were in France called *oblates*. The offering of children as oblati was often used in times of trouble as a means of putting them under the protection of the church. Lay monks or infirm soldiers, maintained in the monasteries, were also called oblates. Under the name of Oblati of St. Ambrose a congregation of secular priests was established at Milan in 1578 by St. Charles Borromeo. Other orders were subsequently founded under the names of Oblates of the Immaculate Conception, Oblates of the Church, &c.

The Oblates of Mary Immaculate, or of the Immaculate Conception, were founded in 1815, at Aix, by the Abbé Mazenod, afterwards Bishop of Marseilles. Their constitution was approved of by the pope in 1826. Their duties were to consecrate themselves to parochial missions in their dioceses; to spiritual ministrations, especially to the young, to the poor, and to prisoners; to the direction of public seminaries and the teaching of theology, and to foreign missions. In 1841 the order sent missionaries to Canada on the requisition of the Bishop of Montreal. The order has since developed so rapidly that it has been found necessary to divide it into provinces. Besides its seminaries in Marseilles, Ajaccio, Frejus, and Valence, it has houses or missionary establishments in France, England, Scotland, the United States, Canada, and other British possessions.

OBLIGATO, or OBBLIGATO (Italian, required), in music, a part or accompaniment in a composition for a particular instrument of such character and importance that it is indispensable to the proper performance of the piece. A well-known example of an obbligato occurs in Handel's Messiah, viz., the trumpet accompaniment to the air, 'The trumpet shall sound.'

OBOE, a musical wind instrument resembling a clarionet in shape, and sounded through a double reed. It consists of three joints besides the mouthpiece, and its compass is generally from B below the treble clef to F in alt, with the intermediate semitones. This large compass of two octaves and one fifth, the oboe, like many other wind instruments, owes to the over-blowing of the player, which produces a series of overtones. The four or five lower tones are somewhat weak and thin, and the two or three upper tones harsh and shrill, but not objectionable in fortissimo passages. The name oboe is from the Italian; the French form, hautboy (*hautbois*), was formerly more frequently used.

OBOLUS, a Grecian coin of silver or copper, the sixth part of a drachm, about $10\frac{1}{2}d.$ in value. In early times instead of money little pointed pieces of iron or of copper (*obolos*, *obelos*, a spit) were used. Six of these filled the hand, and made a drachm. The same name was afterwards given to the coin.

O'BRIEN, WILLIAM SMITH, an Irish agitator, was born in 1803, being the second son of Sir Edward O'Brien, baronet of Dromoland, in the county of Clare. He was educated at Harrow and Cambridge, and in 1826 was elected member of Parliament for Ennis. He supported Catholic emancipation. In 1835 he was returned for Limerick as an advanced Liberal, and professed himself an advocate of legislative justice to Ireland. Being unable to secure what he considered the rights of his country, he rebelled against the authority of the speaker, and refused to serve on committees, for which he was committed to prison. In 1841 he withdrew from Parliament, and joined O'Connell in agitating for repeal of the union. He subsequently joined the Young Ireland party, which was in favour of an appeal to physical force, of which O'Connell disapproved. In 1848 an insurrection was actually attempted, which was easily suppressed by the police, an air of ridicule being thrown over the affair by the arrest of O'Brien, who had been popularly designated as the King of Munster, in a cabbage garden at Thurles. He was tried at Clonmel, and sentenced to death, on 9th October. The sentence was commuted to transportation, and in 1856 he received a pardon. He died at Bangor in 1864.

OBSCENE BOOKS AND PICTURES. The act 20 and 21 Vict. cap. lxxxiii. (1857), called Lord Campbell's Act, gives summary power for searching of houses where obscene books, prints, &c., are suspected of being kept, and for the seizure and destruction of such books, &c. The sale or obtaining or procuring of them with intent to sell is a misdemeanour, and is punishable by fine or imprisonment.

OBSCURANTISM (from Latin *obscurare*), a word derived from Germany, where it was originally used at the time of the revival of learning, to signify opposition to progress and enlightenment. Those who set themselves, in the interest of existing opinions or customs, to oppose all new views, irrespective of their origin, were called *Obscurants*.

OBSERVANTISTS. See FRANCISCANS.

OBSERVATORY, a building devoted to astronomical, magnetic, meteorological, or other observation of natural phenomena. We find mention of observatories at a very early period; Diodorus tells us of a tower in the temple of Belus, in Babylon, from which the Chaldæan astronomers made their observations. Copernicus was the first who (1540) set an instrument in the meridian. The first regular observatory was erected at Cassel in 1561. The principal observatories at present in existence are those of Greenwich, Paris, Pulkova, Copenhagen, in Europe; Washington and Cambridge, U.S.; and Sydney, Australia. There are many others, and the number of private observatories is large, and is increasing.

Buildings erected for astronomical observations must be very stable; the instruments must be out of contact with the walls, and are therefore attached to stone pillars, which rest on foundations separate from the rest of the building and out of contact with the floors. The derangements produced by the effects of changes of temperature, humidity, &c., on the supports are observed and allowed for with constant care. The 'transit instrument' (which see), 'transit circle,' and 'mural circle,' can be used only for meridional observations; that is, to observe objects in the meridian. The 'equatorial' (which see) and the 'altitude and azimuth' are employed for the observation of objects in other parts of the heavens.

The variations of the terrestrial magnetic elements are recorded in magnetic observatories. (See MAGNETISM—TERRESTRIAL.) In the United Kingdom such observations are made at Greenwich and Dublin, at Kew, Glasgow, Armagh, and all the other chief meteorological establishments. Photography has been applied to register the variations of the magnetic elements; light from a fixed lamp being reflected from a mirror on the magnet, whose changes of position denote variations of a magnetic element, to form a bright image on a sheet of sensitized photographic paper. This paper covers a roller which is made to revolve uniformly by clock-work. Each sheet lasts twenty-four hours, at the end of which time it is removed and photographically 'fixed.' Finding the absolute value of the magnetic elements at certain regular intervals forms the chief part of the magnetic work of an observatory. Readers are referred to the treatise on Magnetism (1874), by Dr. Lloyd, of the Dublin University and to the British Association reports on Kew Observatory from 1842. All the magnetic observatories are also meteorological observatories. See METEOROLOGY.

OBSIDIAN, a variety of felspathic lava. See PUMICE and PITCHSTONE.

OCCAM (or OCHAM), WILLIAM DE, an eminent scholastic philosopher, was born at Occam, in Surrey, about 1270. Little is known of the facts of his life. He is said to have studied at Merton College, Cambridge, and also to have attended the lectures of Duns Scotus in Paris. He is also said to have taken orders in the church, and received several appointments. According to one account he refused the archdeaconry of Stow in 1300, but accepted a prebend at Bedford, and afterwards (1305) one at Stow, which he resigned in 1319. He became, like Scotus, a Franciscan, entering the order of the Cordeliers. He is said to have been expelled from Oxford on account of the theological disputes of which he was the occasion, and to have taken refuge in Paris. At all events the latter and more distinguished part of his life was passed on the Continent. He became an opponent of Scotus and likewise of St. Thomas, and the founder of a revived school of Nominalism, the adherents of which were called *Occamites*. In 1322 he was chosen provincial of his order by the English Cordeliers, and in this capacity attended a general assembly of the Franciscans held at Pérouse. He supported Philippe le Bel in asserting the independence of temporal princes in secular affairs against the pope, and with the support of the general of his order denounced the vices of the popes. For this he was condemned by the Council of Avignon, and being compelled to flee from Paris (1328), he took refuge with Louis of Bavaria, who was at variance with Pope John XXII. He died at Bavaria in 1347. He is said before his death to have been reconciled to the church. He is entitled *Doctor singularis et invincibilis*. The latter epithet is said to have been bestowed upon him by the pope. He is also styled *princeps nominalium*. Occam was one of the most eminent logicians of the middle ages, and the best dialectician of his school, and is entitled to high honour as a defender of liberty of thought and opinion against the most powerful established influences. The Franciscans and Dominicans taking their opinions respectively from Duns Scotus and Thomas Aquinas, he found himself, in differing from them, at once isolated from his own order and condemned by their opponents. The courage he manifested in supporting the secular power against the pope was not less remarkable in a monk. He was so consistent in his denial of the reality of all general or abstract ideas that he held even the existence of a God to be purely a matter of faith, neither cognizable by intuition nor capable of rigorous proof by reason. Among his works are Disputatio super potestate ecclesiastica prælatis atque principibus terrarum commissa; Super iv libros Sententiarum subtilissimæ quæstiones earumque decisiones; Quodlibeta septem; Summa logices; Quæstiones in libros Physicorum; Centiloquium Theologicum, Opus nonaginta Dierum contra Errores Joannis XXII., and Compendium Errorum Joannis Papæ XXII.

OCCASIONAL CAUSES (*causes occasionnelles*) is the name of the doctrine evolved by the Cartesians in order to explain the reciprocal action upon each other of the soul and body. According to Descartes soul and body constitute two entities, having entirely different properties; the essence of the one is thought, that of the other extension. Accordingly there is a difficulty in conceiving how the one can act upon the other. Descartes assumed that their intercommunication was the result of divine interference. This suggestion was developed by his followers into the doctrine of occasional causes. According to this doctrine it is God himself who, on the occasion of the determinations of the mind, excites in the body the sensations which correspond to them, and on the occasion of the motions of the body excites in the mind the sensations and passions which correspond to them. This doctrine was especially developed by Malebranche and Guelinx. Malebranche gave it a mystical development; Laforge restricted it to involuntary movements.

OCCULTATION, the eclipsing of a star or a planet by the moon or a planet.

OCEAN, or SEA, the general name given to the vast body of water which forms the superficial covering of nearly three-fourths of our globe, the Earth. It everywhere surrounds and insulates the land, even the continental portions of which are dwarfed by comparison with the adjoining waters. Along the line of the equator the Pacific Ocean alone exhibits unbroken continuity of water through more than 150 degrees of longitude, or above 10,000 miles, which is more than two-fifths of the earth's circumference; and in the opposite direction, along the line of a meridian passing through Behring Strait, the waters of the same ocean are uninterrupted by land through a measure which is of equal (perhaps greater) length. In the total the water-surface of the globe probably equals, in round numbers, about 145½ millions of square miles, while the total land-surface is not more than 51½ millions.

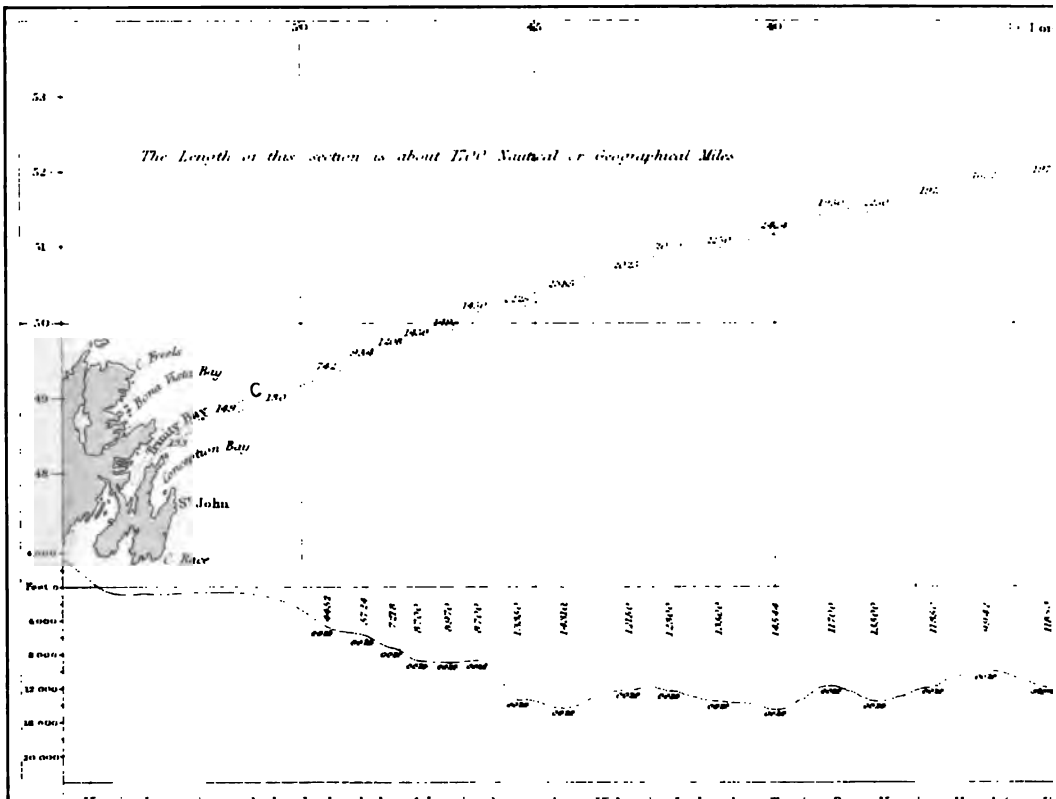
The true relationships of land and sea, however, are best appreciated by regarding the water as occupying the hollows or depressions which occur in the irregular surface—outer rind, or covering—of a spherical body, the earth. This solid rind or crust is really continuous, but its more depressed portions are covered by the waters, which, in accordance with the law which uniformly regulates the movement of fluids, seek the lowest levels. Where these depressions are of great extent the water forms oceans or seas; where they are of smaller dimensions it interpenetrates the land, forming inclosed or partially

land-locked basins, as inland seas, gulfs, channels, and the like. The relative areas of adjacent land and sea, with the external contour of each (that is, coast-line), depend upon the respective elevation of the one above the other. Geological science makes it certain that, comparing present with former periods in the history of the globe, these areas have changed place, and it is equally certain that changes operating in the like direction are still in progress. A few hundred feet of rise in the level of the ocean-bed would in some cases convert what are now shallow seas into inland plains; and an equal amount of subsidence would cause the sea to flow over what are now extensive river-basins. In either case the contour of land and sea would be completely altered.

The names Pacific, Atlantic, Indian, are convenient terms by which to distinguish the great bodies of water which divide the land-masses of the Old and New Worlds, and which intervene between the former and the southern continent, Australia. But they have no definite limit to the southward, and the belt of the Southern Ocean, to which the waters of all three are common, stretches round the globe. Of the Arctic Ocean the portion that washes the shores of Northern Europe and Asia is obviously a prolongation of the Atlantic, and in respect of its currents and other conditions must be treated as a portion of the Atlantic basin. Of the Polar Seas, strictly so called, the superficial limits—to say nothing of other conditions—are as yet only partially determined. It is within the Atlantic, the most frequented of the oceans, that the vastly greater number of observations, directed to the determination of depth, temperature, movements, forms of life, and other conditions of the deep waters, have hitherto been made.

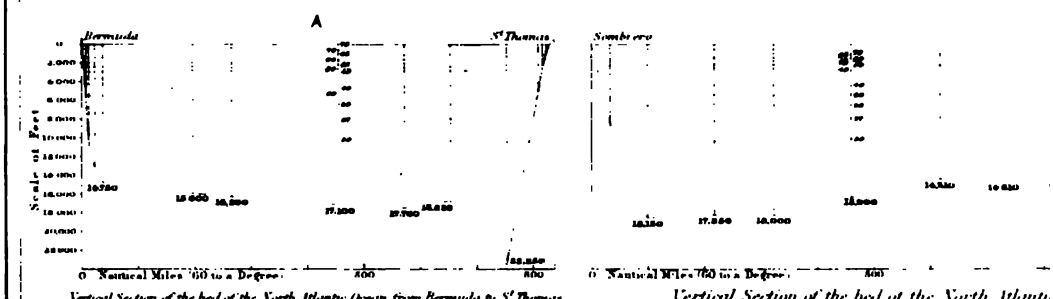
The combined saltness and bitterness of sea-water are due to the presence in it of various saline ingredients, of which chloride of sodium or common salt is by far the largest item. The proportion which these saline contents bear to the entire body of water varies, in the case of different seas, between 3 and 4 per cent., in a few cases exceeding the latter ratio. Within or near the tropical belt the proportion of salt is generally rather greater than is the case within higher latitudes. Local differences in this respect are, however, observed, and are not difficult of explanation. The average saltness of the Atlantic appears to be a little in excess of $\frac{35}{1000}$ths; that of the Indian Ocean, about $\frac{33}{1000}$ths; of the Pacific, between the Malay Archipelago and the Aleutian Islands, $\frac{35}{1000}$ths, and between the Aleutians and the Society Islands $\frac{35}{1000}$ths. The saline contents of the Mediterranean amount to $\frac{38}{1000}$ths (nearly 4 per cent.), and those of the Red Sea to $\frac{43}{1000}$ths. In the Baltic, on the other hand, the proportion of saline matter (which, moreover, varies greatly in different localities, as well as with the seasons, becoming greater when the inflowing water of its numerous rivers is at its minimum, and the reverse) is very much lower than the average; and in the Gulf of Bothnia the water is at times so little salt as to be quite drinkable. The Red Sea (Indian Ocean) and the Baltic (Atlantic Basin) offer extreme examples of the way in which the salinity, and with it the higher or lower specific gravity of sea-water, as well as the mean level of the surface, are determined by the balance between influx and efflux, the former represented by the accession of water due to inflowing rivers and to rainfall, the latter by the loss due to evaporation. The Red Sea does not receive a single perennial stream, while evaporation from its heated surface is excessive, and since the latter force only carries off the water, leaving the solid portion of its contents—that is, the salt—behind, the whole sea would become (like the Dead Sea) a mass of brine, were it not for the communication with the open ocean supplied by the Strait of Bab-el-Mandeb, through the medium of which its denser water finds, from greater specific gravity, an outlet, while the inflowing lighter water constitutes a surface-stratum, and maintains the level. The Mediterranean makes near approach to the condition of the Red Sea in this regard; its more considerable rivers, comparatively to its great dimensions, are by no means numerous, and only one of them (the Nile) is of first-class magnitude. In the Baltic the reverse is the case; the inflow derived from rivers is excessive, while the loss due to evaporation is at a minimum. Inflowing surface-currents, through the Straits of Gibraltar and Bab-el-Mandeb respectively, in the case of the Mediterranean and Red Seas, and out-flowing currents in that of the Baltic, through the Sound and the Belts, are due to these conditions. Measured by the largest of terrestrial scales—that is, by the magnitude of the earth, the ocean may be regarded as a vast salt lake, the average level of which is maintained by influx of rivers, while evaporation prevents any increase in the total contents of its basin. Every inflowing stream carries into it some portion of the saline and other particles derived from the strata through which its course has lain, while the accumulation of these ingredients beyond a given ratio (which, however, as we have seen, is within certain limits a fluctuating quantity) is prevented by the enormous extent to which salt is absorbed in maintaining the functions of vegetable and animal life by the myriad living organisms with which the waters abound. Such bodies of water as the Caspian, the Aral, the Kokonor, and others, are seas in the true sense of the term, and have no claim to the title of lakes, with which purists in geography would class them. Like the ocean itself, they receive running streams, and have no other medium of discharge than is supplied by evaporation.

The deep-sea soundings so numerously taken within recent years have added vastly to our knowledge of the ocean-bed. This (as had, indeed, been surmised) is proved to exhibit like inequalities to those presented by the surface of the land, of which it is the counterpart. The sea-bottom has its various slopes, its extended plains and plateaus (of which that occupying, in the North Atlantic, the greater part of the included space between the coasts of Ireland and Newfoundland, and upon which the telegraph cable is laid, is one of the most notable, and is shown in the upper half of Pl. CXXXVI.–CXXXVII.), its mountain chains, detached peaks, and areas of comparative depression. Its mountain tops rise above the level of the water, and constitute the islands of a deep sea; or, as in the case of the British Islands, exhibit moderately-elevated grounds that are based upon a submarine bank. The general depth of the great ocean is, however, less than had been, until very recently, supposed; and it is admitted that the earlier observations directed to the ascertainment of depth were untrustworthy—owing mainly to the difficulties in the way of reaching the bottom by a line which should descend vertically, or so nearly so as not to vitiate the desired result. The various modifications of Brooke's 'deep-sea sounding apparatus,' now employed for this purpose, provide for the leaving behind (that is, at the bottom of the sea) the heavy mass of metal—sometimes from 1 to 2 cwt.—used as a plummet, while a metal rod at the end of the detached sounding-line is provided with a hollow chamber, or else a cup-shaped receptacle, so as to bring up with it some of the contents of the ocean-bed. These different kinds of sounding-apparatus, as well as the kinds of dredge that are used in the efforts to obtain samples of the living organisms (sponges, corals, star-



Vertical section of the bed of the Atlantic Ocean from Valencia, Ireland, to Trinity Bay, Newfoundland (on li

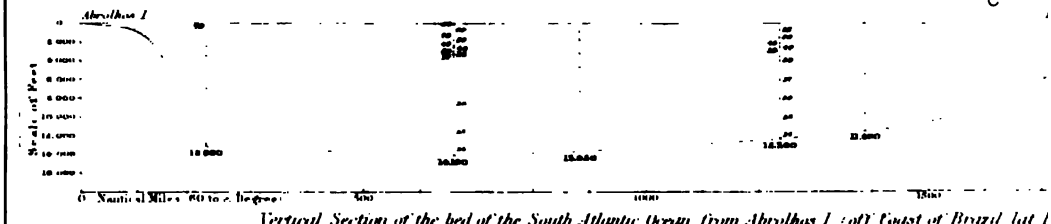
The Vertical scale showing depths of



Vertical Section of the bed of the North Atlantic Ocean from Bermuda to St Thomas.

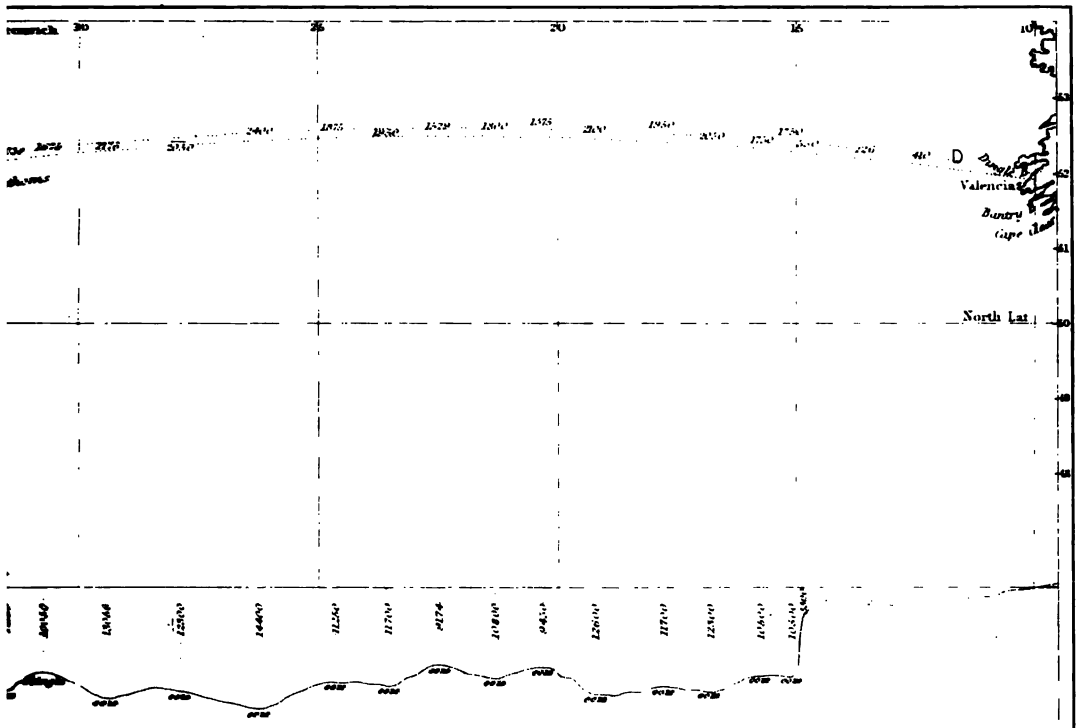
with Temperatures at successive Depths from Observations made by H.M.S. Challenger 1873.

Vertical Section of the bed of the North Atlantic

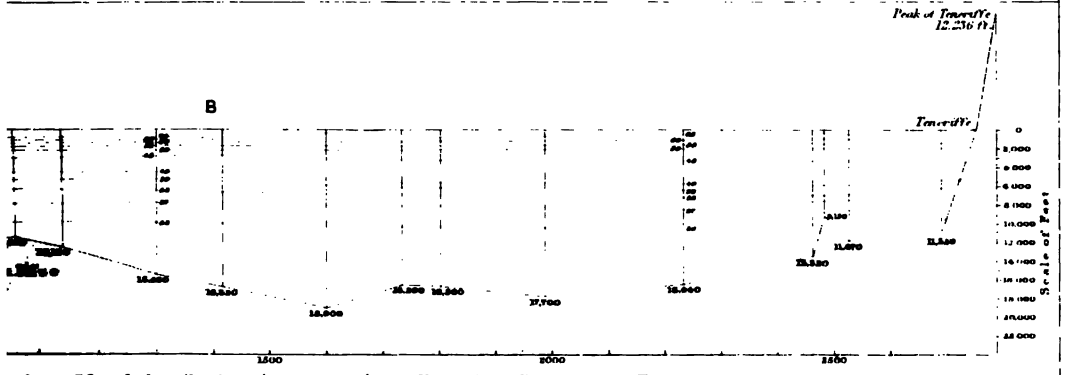


Vertical Section of the bed of the South Atlantic Ocean, from Abrolhos I. off the Coast of Brazil, lat 1

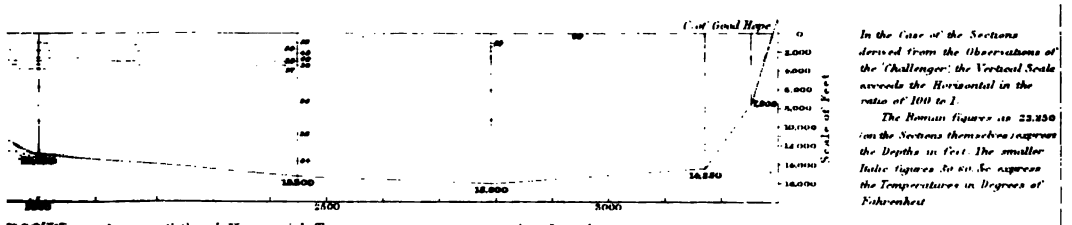
from Observations made by H.M



above) showing Soundings made by Lieut. Dayman in H.M.S. Cyclops, 1857, for laying the Atlantic Telegraph Cable.
72 times greater than the longitudinal scale.)



mbrero, West Indies (lat. 18° 35′, long. 63° 27′, near Virgin Is.) to Teneriffe, with Temperatures at successive Depths.
(from Observations made by H.M.S. 'Challenger,' 1873.)



In the Case of the Sections derived from the Observations of the 'Challenger,' the Vertical Scale exceeds the Horizontal in the ratio of 100 to 1.

The Roman figures as 23,456 on the Sections themselves express the Depths in Feet. The smaller Italic figures 56 to 80 express the Temperatures in Degrees of Fahrenheit.

"30" W.) to Cape of Good Hope, with Temperatures at successive Depths.

fish, and myriad foraminifera), belonging to the deep waters, are described at length in Professor Wyville Thomson's Depths of the Sea, a volume which embodies the results of the dredging cruises of H.M.SS. *Porcupine* and *Lightning* during the summers of 1868–69–70, under the able scientific direction of the author, with the aid of Dr. Carpenter and other scientific inquirers. Additional and later results, belonging to the like fields of inquiry, pursued over a vastly more extended area, have been obtained from the observations of the *Challenger* (1873–75), pursued round the circuit of the globe, and within each of the great oceans.

The diagrams on the lower half of Pl. CXXXVI.–CXXXVII. exhibit some of the more important observations made by the scientific staff of the *Challenger* within the Atlantic basin, alike as regards

Sketch Map illustrative of observations of H.M.S. Challenger, as shown on Pl. CXXXVI.-CXXXVII.

depth and temperature. The greatest observed depth, 23,250 feet (3875 fathoms), was found, it will be seen, in close proximity to the island of St. Thomas, West Indies. This, which exceeds by a half the altitude of Mont Blanc above the mean sea-level, and nearly equals the highest elevations of the Andes, is the maximum depth hitherto ascertained within the Atlantic basin. Observations made by Commander Belknap, of the United States navy, in the *Tuscarora* in 1874–76, show much greater depths within the Pacific. The greatest depth sounded by the *Tuscarora* was close to the Kurile Islands in lat. 44° 55′ N., lon. 152° 26′ E., where the sounding line sank 4655 fathoms or 27,930 feet, which is rather more than a thousand feet less than the height of the highest mountain in the world. Depths exceeding 18,000 feet, and some that exceed 20,000, have been found both by officers of the British and the United States navies in various parts of the Atlantic, now sufficiently explored to enable something like a contour-representation of its bottom to be attempted. About midway between its opposite shores, those of North and South America on the west and those of Europe and Africa on the east, there extends a ridge in a zigzag shape from about the latitude of Southern Ireland to at least lat. 40° S. In the north this ridge is connected with a broad plateau which connects Europe with Iceland, and from the plateau it proceeds, under the name of the Dolphin Rise, first south then south-west to about the latitude of the north coast of South America, where it turns sharp east-south-east, in which direction it continues to about lon. 10° W., where it finally takes a southerly direction. The depth of the ridge below the surface is from 1000 to 2000 fathoms. On the east side of the ridge a basin with an average depth of about 2500 fathoms extends from the northern plateau to about the Cape of Good Hope, where it is bounded by another ridge stretching transversely, from a point near the southern extremity of the main ridge to the eastern coast. The western submarine valley is divided into two basins by a short ridge connecting the first angle of the main ridge with the north-east coast of South America. Of these two basins the northernmost has an average depth of about 3000 fathoms, and in this portion, as above mentioned, are the greatest depths that have yet been sounded in the whole ocean. The other basin on the west side has also an average depth of about 3000 fathoms. The British Islands lie on an elevation which includes the whole of the North Sea, and gradually sinks on the east down to the deep channel which borders the coast of Norway from the Skager-rak to Cape Stat, and on the north to another deep submarine channel which stretches from Shetland to the Faroe Isles. The Bahamas and West Indies lie on a similar elevation on the south-west of the North Atlantic basin.

A valley about 500 miles wide, and with a mean depth of 2500 fathoms, stretches from off the south-west coast of Ireland, along the coast of the European continent, dipping into the Bay of Biscay, past the Strait of Gibraltar, and along the west coast of Africa. The bed of the mid-ocean immediately west of this valley exhibits a moderate rise, prolonged in the direction of north and south, the mean depths in which range between 1000 and 1500 fathoms, and the highest portion of which rises to the surface in the volcanic group of the Azores. Thence farther westward the sea-bed again deepens, making in many cases near approach to 3000 fathoms, until within 200 miles of the American coast. To the south of the parallel of 20° north latitude the two valleys above traced become united in the vast depression of the great ocean, which, with local exceptions, appears to stretch thence far into the southern hemisphere, and of which section C (see the plate) supplies instructive illustration, in the direction of north-west and south-east, between the coast of Brazil and the mountain peak of Tristan d'Acunha, and in that of east and west, between the last-named point and the southern end of the African continent.

The observed temperatures of the sea at successive depths—requiring to be made with thermometers protected by a thin outer covering of metal, to resist the increasing pressure of the great body of water—have disproved many of the assumptions long entertained in regard to a supposed uniform minimum of cold, as the familiar use of the dredge (employed in recent cases to depths as great as 3 miles, and in such manner as literally to sweep the bottom of the deep sea and bring portions of its contents to the surface) has modified very materially the ideas entertained until within a recent date respecting a supposed bathymetrical limit of living organisms, now proved to have no existence. Forms of life in myriad swarms exist within the lower depths of ocean, and their decomposed remains, not less than the substances which are carried down by running waters, are helping to strew the ocean bed with the materials of which future continents will be composed. Sea water, unlike fresh water (which has its maximum density at a temperature of 39° or 40° Fahr., and freezes at 32°), continues to increase in density down to its freezing-point, which, when the the water is undisturbed by external influences, is as low as 25°. Its

surface-temperature exhibits a much less extensive range than that of the land, and the temperature of the superjacent air is maintained with much greater approach to uniformity in the case of the one than in that of the other. Hence the equalizing influence which the sea exerts in the case of climate. The mean surface-temperature of the sea is generally coincident (or nearly so) with that of the air at the place of observation, and it nearly always, within every zone of the globe, exhibits a decrease of temperature downwards. But the ratio of this decrease, as the sections given on the plate show, varies very greatly; it is generally rapid within the first few hundred fathoms of descent, and afterwards diminishes very gradually downwards, showing in general remarkable uniformity over extensive areas. The lines of equal depth-temperature, as the sections show, deviate remarkably little from the direction of parallels to the surface, and the deviation, such as it is, becomes immensely exaggerated beyond the reality by the necessity of employing in its linear representation a vertical scale which is very greatly in excess of the horizontal scale. Local exceptions to the law of generally-decreasing temperature in the direction of depth will, however, occur. Thus it has been exceptionally found within Arctic latitudes that a surface stratum of cold water—its temperature perhaps unduly lowered by the melting of ice, and with a low gravity, due to its reduced salinity—is succeeded for a moderate depth by a substratum of warmer water; but in such a case the warmer substratum rapidly gives place to colder water, found at still greater depths below. The ratio of decreasing temperature is no doubt affected in a large number of cases by the streams or currents of the ocean, many of them found at great depths. (See CURRENTS, MARINE.) The warm area of the Gulf Stream furnishes striking examples of this, as also do other parts of the Atlantic. Between the parallels of 60° and 61° north latitude a surface temperature of 49° diminishes downward until at 640 fathoms it is reduced to 29° Fahr. Off the coast of Portugal a fall of 9° in temperature has been found between 800 and 1000 fathoms. Even within a few degrees of the equator a temperature very little above the freezing-point of fresh water is found at depths of 2000 fathoms and upwards. The temperature of the Mediterranean, below a surface-stratum of about 50 fathoms, to which the direct solar heat may be assumed to penetrate, is found of remarkable uniformity, remaining nearly 54° Fahr. to the very bottom.

Many other topics besides those here treated of fall within the vast range of inquiry which the word Ocean suggests, most of them, however, claiming notice under distinct headings, even did not the necessary limits of space prevent their discussion here. The sea is alike the great source and the great receptacle—through the medium of evaporation, rainfall, springs, and inland streams or rivers—of all the waters of the earth, and in the course of the vast cycle of change to which it belongs, and of which indeed it forms the most important portion, constitutes the great regulator of terrestrial climate, and with it of the infinitely-diversified life of the globe.

OCEANIA, a name which has been given to a fifth division of the world, and includes all the islands of the Pacific between Asia on the north-west, the Indian Ocean on the west, the Antarctic Ocean on south, and America on the north and west. A subdivision of Oceania adopted by some geographers is into Western Oceania or Malaysia, corresponding with what is better known by the name of the Malay Indian or Eastern Archipelago, Micronesia or Northern Oceania, Polynesia or Eastern Oceania, and Melanesia or Southern Oceania.

OCEANUS, in Greek mythology the eldest of the Titans, and a personification of the sea. He was called the son of Gæa (the earth) and of Uranus (heaven). Oceanus and Tethys were the parents of rivers, and of the race of goddesses called *Oceanides*. According to another account he was the father of all gods and men. He always appears as a peaceful god, and he took no share in the mutilation of Cronus. He was not therefore cast into Tartarus with the Titans. On account of his circumspection and mildness he was called the *father of wisdom*. The physical idea attached by the Greeks to the term Oceanus, was that the earth was a flat circle surrounded by a river (Oceanus), out of which the sun and stars were supposed to rise and set, and on whose banks were the abodes of the dead. The term ocean was thus applied especially to the Atlantic, or sea beyond the Pillars of Hercules, in contradistinction to the Mediterranean or internal sea.

OCELLUS, the term applied to structures found in various groups of Invertebrate animals, consisting of spots of pigment inclosed in capsules or cavities, generally supplied with nerve-filaments, and to which the function of sight has been attributed. The names 'pigment-spots' or 'eye-spots' have also been given to these structures. Thus they are found in the Medusidæ or Jelly-fishes around the margin of the bell-shaped body. (See MEDUSIDÆ.) The Lucernaridæ (which see) also possess ocelli. In Actinozoa pigment-spots occur at the bases of the tentacles. In the Sea-urchins ocelli exist at the summit of the shell, and in the Star-fishes these structures are situated at the tips of the rays. In the latter case each ocellus consists of a mass of pigment with a lens in front and nerve-fibres behind; and although the essential conditions of an organ of sight are thus present, yet the perceptions or sensations capable of being received by such an organ must be of a rudimentary and unspecialized nature, and cannot in any sense be compared with the distinctive and visual powers of the higher animal. In Insects and other Annulosa, besides the compound eyes which they possess, simple eyes or ocelli are also found; and in some Molluscs, as is well seen in the Pectens or Scallops, ocelli are situated around the edges of the 'mantle' which lines the shell.

OCELOT (*Felis pardalis*), one of the Carnivorous Mammalia, included in the family Felidæ. It is smaller than the leopard, averaging about 3 feet in length exclusive of the tail, and in height measuring about 18 or 20 inches. Its body-colour is a gray or grayish-brown intermixed with a light fawn colour, and the markings exist in the form of patches disposed in linear series, each consisting of a blackish ring, paler at its inner margin, and inclosing the ordinary fur-colour within. The patches on the head and neck are of black colour throughout, and do not inclose a central lighter space. The colours of the male ocelot are more pronounced than those of the female. The ocelot inhabits South America. Its food consists of the smaller Mammalia, such as deer, and birds. It is generally found within forests, and in general habits and disposition appears to be rather timid, or even cowardly, than otherwise. It is in general not readily tamed, although instances are on record in which these animals have become domesticated.

OCHIL HILLS, a mountain range, Scotland, on the borders of Perth, Clackmannan, Kinross, and Fifeshire; average breadth, about 12 miles; highest summit, Bencleuch, in the south-west, about 2300 feet above sea-level. The Ochils are of basalt and greenstone, and contain copper and iron ores.

OCHRE, a name applied to various metallic oxides which occur in a pulverulent form. Thus we speak of iron or red ochre, molybdic ochre, &c.

OCHTERLONY, Sir David, Bart., major-general in the British East India Company's service, was born in Boston, United States, in 1758. At the age of eighteen he went to India as a cadet, in 1778 was appointed ensign, and in September of the same year lieutenant on the Bengal establishment. Lieutenant Ochterlony rose by merit through the intervening ranks, and in 1803 was made lieutenant-colonel. In the Mahratta war of 1803–4 he distinguished himself on several occasions, and after the great battle of Delhi was appointed resident at that court. On the restoration of peace he received the command of the fortress of Allahabad, and in 1809 commanded a force stationed on the Sutlej to overawe the Sikhs. In 1812 he was promoted to the rank of colonel, and in 1814 to that of major-general. In the Nepalese war he commanded a division, which was instructed to advance through a difficult country against Umer Sing, a brave and experienced warrior, whom he compelled to surrender in the almost inaccessible fortress of Mallown. The chief command was now given to General Ochterlony, who brought the war to a close, September, 1815, after a series of skilful operations and brilliant successes. His services were rewarded by the prince regent with the order of knight-commander of the Bath and the dignity of baronet, and by the East India Company with a pension of £1000 per annum. In 1816 Sir David Ochterlony was created knight grand cross of the Order of the Bath, and in 1817 the thanks of the two Houses of Parliament were voted him for his skill, valour, and perseverance in the Nepalese war. In 1817 he was invested with large powers for settling the province of Rajputana. In 1818 he was appointed resident at Delhi, with the command of the third division of the grand army, and in 1822 was intrusted with the superintendence of the affairs of Central India, as resident and political agent in Malwa and Rajputana. He died in India, July 15, 1825.

O'CONNELL, Daniel, a celebrated Irish barrister and agitator, born at the village of Cahir, county of Kerry, on the 6th of August, 1775. After receiving his first education at a school in the Long Island, 2 miles from Cove, he proceeded to the Continent, and prosecuted his studies successively at Liége, St. Omer, and Douay. In 1793, on his return home, he began to study for the bar; and in 1798, having been called to it, he soon began to distinguish himself both by his legal skill and his oratory. For the latter Ireland was at this time an excellent field, and after a speech made at Dublin in the beginning of 1800, at a meeting held to petition against the union, he was regarded as one of the most promising and energetic of the Catholic leaders. The question of Catholic emancipation being now seriously agitated, O'Connell, without allowing his attention to be distracted from the duties of his profession, was ever ready to assist in any scheme for the removal of the national grievance, and succeeded in baffling all the measures of government to prevent the organization of societies having that object in view. While thus engaged he became involved in 1815 in a quarrel with Mr. D'Esterre, a member of the Dublin corporation, who somewhat quixotically took offence at some opprobrious epithets applied to that body. A duel was in consequence fought, which cost D'Esterre his life. At a later period Mr. O'Connell expressed deep contrition for having thus stained his hands with blood; but that he had not yet begun to see duelling in its true light was made manifest a few months after by his readiness to accept a second challenge. The sender of it was Sir Robert Peel, then chief secretary for Ireland. Most fortunately their hostile intentions had become known to the authorities and were frustrated. The agitation on the subject of Catholic emancipation now daily assuming larger dimensions, O'Connell took a step which brought matters to a crisis. The crying grievance was that Catholics could not sit in Parliament without perjuring themselves, by taking an oath contrary to conscience. But though it was thus impossible for a conscientious Catholic to take his seat, there was nothing to prevent him from being elected; and the step which O'Connell took was to start as a candidate for the county of Clare, where a vacancy had occurred. By the aid of the priests he more than counterbalanced the influence of the landlords, and having carried the day appeared in the House of Commons to claim his seat. Of course he never meant to comply with the preliminary step which he knew to be indispensable, but his object was notwithstanding gained. His election was a great fact which could not be ignored. Many Irish landlords seeing their influence with their tenants endangered became converts to emancipation, liberal politicians of all grades who had previously advocated it became more zealous than ever, and at last even a Tory ministry, with the Duke of Wellington at its head, declaring that they must either concede it or risk a civil war, wisely made choice of the former alternative. O'Connell was now able not only to secure a seat for himself, but to be a distributor of seats to others, who, sitting in Parliament merely as his nominees, were nicknamed in the slump 'O'Connell's tail.' While pursuing his course of agitation he could hardly avoid making a considerable sacrifice of his practice as a lawyer, and on this ground he was for many years the annual recipient of a large sum contributed voluntarily, or under priestly pressure, by the great body of his countrymen, and levied in most of their parishes under the name and with all the regularity of 'rent.' It would perhaps be uncharitable to say that this revenue, which the state of his affairs made most acceptable, had any influence in inducing him to continue the trade of agitator; but it is certain that, instead of resting satisfied with emancipation, he started a new grievance, and began in 1843 to hold monster meetings for the repeal of the union between Great Britain and Ireland. Being arrested in October, 1843, on a charge of conspiracy and sedition, he was convicted, and sentenced to fine and imprisonment. The House of Lords (4th Sept. 1844) reversed the judgment. In 1847 he set out on a visit to Italy, intending to proceed to Rome; but he only reached Genoa, where he died, 15th May, 1847.

O'CONNOR, Feargus Edward, a noted demagogue and chartist leader, was the second son of Roger Page O'Connor, of O'Connorville, Bantry, and born in 1796, at Dangan Castle, in Meath, of which his father was tenant from the Wellesleys. He studied for and was called to the bar, but his principal ambition was to shine as a political orator. In 1832 he was returned member for the county of Cork to the first Parliament assembled after the passing of the Reform Bill. In 1835 he was again returned, but unseated on the ground of disqualification. Several unsuccessful attempts were subsequently made by him, and it was not till 1847 that the chartist or democratic party procured his return as member for Nottingham. About this time his influence with politicians of an extreme class was considerable, being regarded by the chartists as their champion, and taking a prominent part in all their proceedings. In April, 1848, he presided at a monster meeting on Kennington Common, from which it was proposed to march in force to Parliament, and

present the People's Petition. More orderly resolutions, however, prevailed, and the bulky petition was conveyed to the house in three cabs. In 1852 Mr. O'Connor began to exhibit such symptoms of violent and extravagant conduct, having been once committed by the speaker for insubordination to the custody of the serjeant-at-arms, that it became manifest his mind was affected, and on examination this proved to be the case. He was conveyed to a lunatic asylum, and from thence, a short time before his death, to his sister's house at Notting Hill, where he expired on 30th August, 1855. It is but fair to add that Feargus O'Connor's enthusiasm was honest, and he never appears to have been actuated by selfish or mercenary motives.

OCRACOKE INLET, an inlet of North Carolina, forming a passage into Pamlico Sound, 22 miles south-west of Cape Hatteras. On each side of the channel are dangerous shoals; on the bar are 14 feet at low water.

OCTAGON, in geometry, is a figure of eight sides and angles, which when the sides and angles are all equal is called a *regular octagon*, and when they are not equal an *irregular octagon*.

OCTAHEDRON, or OCTAEDRON, a body consisting of eight equal and equilateral triangles.

OCTANT, an astronomical instrument, is the eighth part of a circle divided into degrees, and used in calculating the amplitude of the stars, but is now little used.

OCTAVE, in music, the interval between two sounds whose vibrations are to each other in the ratio of 1 to 2. (See MUSIC.) The tone which is at the interval of an octave above another tone is called its octave.

OCTAVIA, daughter of Caius Octavius and of Atia, and sister to the Emperor Augustus. All the historians praise the beauty and the noble character of this celebrated Roman lady. She first married the Consul C. Marcellus B.C. 50, and on his death she married Mark Antony B.C. 40. But Antony was incapable of duly estimating her virtues, and preferred the charms of Cleopatra, which inflamed his passions, to the modest beauty of his wife. After her marriage she followed her husband to Athens, where she passed the winter (B.C. 39) with him, averse from those luxurious pleasures to which he abandoned himself. Without her interposition civil war would even then have broken out between Octavius and Antony. By urgent prayers she appeased her husband, who was incensed against her brother for his suspicions, and then, disregarding the difficulties of the journey and her own pregnancy, she went, with his consent, from Greece to Rome, and induced her brother to consent to an interview with Antony and to come to a reconciliation with him. When her husband went to make war against the Parthians she accompanied him to Corcyra, and at his order returned thence to remain with her brother. New quarrels arose between Octavius and Antony. To have a pretext for a rupture Octavius ordered his sister to go to her husband, in the expectation that he would send her back. This actually happened. Antony was leading a life of pleasure with Cleopatra at Leucopolis, when letters from Octavia at Athens informed him that she would soon join him with money and troops. The prospect of this visit was so unwelcome to Cleopatra that she persisted in her entreaties till Antony sent his wife an order to return. Even now she endeavoured to pacify the rivals. Octavius commanded her to leave the house of a husband who had treated her so insultingly; but feeling her duties as a wife and a Roman she begged him not for the sake of a single woman to destroy the peace of the world and of two persons so dear to her by the horrors of war. Octavius granted her wish; she remained in the house of Antony, and occupied herself in educating with care and tenderness the children which she had borne him and those of his first wife Fulvia. This noble behaviour in Octavia increased the indignation of the Romans against her husband. At last he divorced her, and ordered her to leave his house. She obeyed without complaint, taking her children with her. She died B.C. 11. Augustus adopted her son M. Marcellus, but he died A.D. 23.

OCTAVIUS, or OCTAVIANUS. See AUGUSTUS.

OCTOBER (from the Latin *octo*, eight), originally the eighth month in the Roman calendar, whence its name, which it still retained after the beginning of the year had been changed from March to January. October was called by the Anglo-Saxons *Wyncmoneth*, the wine month. It is still in England the principal month for brewing.

OCTOPUS, a genus of Dibranchiate or 'Two-gilled' Cephalopoda or Cuttle-fishes, forming the type of the family Octopodidæ, the members of which group are familiarly known as 'Poulpes.' These forms, as implied by the name Octopus, possess eight arms of equal length, and which are united to each other by a web or membrane stretching between their bases. The arms possess two rows of suckers, which are sessile or unstalked. The prominent head is joined to the body by a distinct 'neck,' and the body itself is short, generally more or less rounded in shape, and unprovided with side or lateral fins. The shell is internal, and is represented by two short 'styles,' which lie imbedded in the 'mantle.' In the Octopi the third right arm of the male animals becomes developed to form a 'hectocotylus' or sexual organ; and in one species at least this modified arm is said to be detached from the body, and to be deposited within the mantle cavity of the female for the purpose of fertilizing the eggs, a fresh arm being developed as occasion requires. The most familiar species of these forms, which occur in the seas of Europe generally, include the *Octopus vulgaris*, *O. carena*, *O. macropus*, *O. horridus*, *O. brevipes*, &c.

The Poulpes attained a popular notoriety from the tales which were formerly circulated respecting the existence of gigantic members of this group. Although recent discoveries prove that largely-developed members of this and other species of Cuttle-fishes undoubtedly exist, it is almost needless to say that the gigantic dimensions given in such tales are never attained by the Poulpes or other Cephalopods. In the article KRAKEN details of such largely-developed Cuttle-fishes, as well as fabulous accounts of these forms, are noticed. See also MOLLUSCA and CEPHALOPODA.

OCTROI, or OCTROY, an old French term (from *auctoritas*) signifying a grant or privilege from government, is particularly applied to the commercial privileges granted to a person or to a company. In a like sense the term is applied to the constitution of a state granted by a prince in contradistinction to those which are derived from a compact between the ruler and the representatives of the people. Octroi also signifies a tax levied at the gates of French cities, towns, &c., on produce brought in for use.

OCZACOW, or OTCHAKOW, a town in the Russian government of Cherson, with about 5000 inhabitants, situated on the Black Sea, at the mouth of the Dnieper. It was formerly an important Turkish fortress, with a citadel, the walls of which were 25 feet high. In 1737 it was stormed by the Russians, who lost 18,000 men in the attack. The Turks attempted to recover it with a force of 70,000 men, but were repulsed with the loss of 20,000. In 1738 it was given up by the Russians, who had previously destroyed the works. The Turks fortified it anew in 1743, and held it until

1788, when, after a siege of six months, it was stormed by Suwaroff, who razed it to the ground. By the Peace of 1792 it was ceded to Russia; but since the rise of Odessa its commerce has become inconsiderable.

OD, or ODIC FORCE, a force associated with magnetism, and believed to explain the phenomena of mesmerism or animal magnetism and many other natural phenomena, supposed by Baron Reichenbach to have been discovered by him, and which is treated of at great length in his works. It has not found any scientific believers.

ODAHLIC, or, as we call it, ODALISQUE, the name given to the females confined in the harems of the Turkish sultan. See HAREM.

ODAL RIGHT, a free tenure of property, similar to allodial tenure, which prevailed in Northern Europe before the introduction of the feudal system, by which it was generally superseded. Odal or udal tenure still prevails in Orkney and Shetland. It is supposed to be derived from a Danish or Swedish custom giving the right of absolute possession to the first cultivator of waste lands. The tenure has been held by the Court of Session to be the same as allodial. See ALLODIUM and LAND (TENURE OF).

ODD-FELLOWS, a large and extensively ramified friendly society, having its headquarters in Manchester. It was originally an association of a convivial kind, modelled on freemasonry, and still retains watchwords and secret signs. It assumed its present form in 1812. There are numerous lodges in Great Britain and the colonies affiliated to the parent society. There is also an independent organization in the United States of America.

ODE, a poem of purely lyrical character, or of that class of lyrical compositions which express the feelings of the poet in moments of high excitement with the vividness which present emotion inspires. (See LYRICS.) The Greeks called every lyrical poem adapted to singing—and hence opposed to the elegiac poem—an ode (*ōdē*, that is, *song*), from which they did not even separate what the moderns call *songs*. We are acquainted with the Greek odes through the choruses in the Greek dramas, Pindar's heroic odes in praise of the conquerors at the great national games, the few relics of the amatory songs of Sappho, Alcæus, and others, the Anacreontic songs, the imitations of the Greek odes by the Romans, particularly Horace, and through the scholia. Whatever was the subject, or the degree of feeling or excitement, every poem was termed an *ode* provided it was purely lyrical. The name of *odes* was also given to the hymns or praises of the gods (the Homeric hymns excepted, because they are of an epic character), which received different names from the various deities to whom they were addressed; thus dithyrambics were originally hymns in praise of Bacchus. The odes of the ancients are distinguished from the lyrical poems of the moderns by expressing feeling, according to the prevailing character of antiquity, more by the aid of imagery. The *plastic*, or the clothing of inward conceptions in outward forms, is a chief trait of the Greek art; and in the same manner the feeling of the poet expressed itself in a series of striking images. In modern times odes have been more confined to the simple utterance of feeling; and so far has this been carried that they have sometimes been divested of all poetic conception. But a naked expression of feelings does not make a poem; and this is the defect of many of Klopstock's odes. In modern times the ode has been separated from the song, so that *ode* now means that sort of lyrical poetry which expresses the deep emotions of the soul and the alternation of violent and elevated feelings of joy or suffering in the full flow of inspiration.

Odes have been classified according to their subjects. The religious ode, or the hymn, in its proper meaning (see HYMN), has for its subjects God and his works. To this class belong several psalms, likewise the song of Moses and that of Deborah; among the Greek odes some of Pindar's, the Hymn of Cleanthes, and many choruses in the Greek drama; some odes of Horace, for instance the *carmen seculare*, though it has more polish than elevation; the hymns of Rousseau, Gray, Akenside, Thomson, Cowley, and Prior, Klopstock, Herder, and others among the moderns. The dithyrambic (see DITHYRAMBUS) has the full flow of sensual feeling for its subject. The heroic ode celebrates heroes or sons of gods, princes, victory, greatness of mind, &c. Most of Pindar's odes are of this sort, as are also some of Dryden's, Pope's, Gleim's, Schiller's, Goethe's. Of the didactic ode the (so-called) *philosophical* and *satirical* are subdivisions. The name of *didactic* is given to the ode as far as it deals with great, instructive, and inspiring truths. If it utters noble feelings without immediate reference to the present time it is called *philosophical;* if it censures the times, as Horace does, it is termed *satirical*. Further, the ode may celebrate certain particular subjects; and here it loses itself in the unlimited field of occasional poems.

ODENKIRCHEN, a town of Prussia, province of Rheinland, 15 miles W.S.W. of Düsseldorf, on the left bank of the Niers; with manufactures of cotton, woollen, linen, and silk goods, machinery, cigars, a dye-work and a tannery. Pop. (1880), 8778.

ODENSE, a seaport town, Denmark, capital of the Island of Funen, on a stream, and near the fiord of same name. It is well built, and has an ancient and magnificent cathedral, in which several of the Danish kings are buried, a royal palace, an old state-house, and a richly-endowed hospital. The principal manufactures are cloth and iron castings; and the trade, much facilitated by water communication, is considerable. Pop. (1880), 20,804.

ODENWALD, a forest and chain of mountains in Western Germany, between the Neckar and the Main, in the territories of Hesse, Baden, and Bavaria. The Neckar divides the Odenwald from the Black Forest. The Odenwald is about 50 miles in length, and contains 1740 square miles. It presents charming scenery.

ODEON (*ōdeion*, from *ōdē*, a song), among the Greeks, and at a later period among the Romans, a public building devoted to poetical and musical contests. The first odeon was built at Athens by Pericles, and was afterwards used for popular meetings and the holding of courts. At a later period two others were erected by Pausanias and Herodes Atticus, and other Greek cities followed their example. The first odeon was built at Rome in the time of the emperors. Domitian erected one, and Trajan another. The Romans likewise constructed them in the provincial cities, and the ruins of one are still seen at Catania in Sicily. The odeons resembled other theatres, except that they were inferior in extent and were covered with a roof. This name has been given to the second Théâtre Français in the Faubourg St. Germain, Paris.

ODER, a river of Germany, which rises in Moravia, in a branch of the Sudetic Mountains, flows through Silesia, becomes navigable for small boats at Ratibor, passes by Breslau, where it becomes navigable for barges of 40 to 50 tons, enters Brandenburg and Pomerania, and empties into the Baltic. Its whole course is above 500 miles: it receives several navigable streams, and communicates with the Elbe by several canals, and is of very great importance for the trade of the country. The principal places on the Oder are Breslau, Frankfort, and Stettin. In the upper part of its course it is rapid, in the flat

country it frequently overflows its banks. Before reaching the sea it forms the large maritime lake called the *Stettin Haff*, and divides into three branches —the Peene, Swine, and Divenow.

ODESSA, a Russian seaport in the government of Kherson, situated on the Black Sea, between the mouth of the Dnieper and Dniester, on the bay of Adsehai. This place, which is of considerable size and is rapidly increasing, is of modern origin. After the cession of Bessarabia by the Peace of Jassy in 1792, Catharine fixed on this spot, then containing only a few houses, as a commercial emporium. It has a sufficient depth of water for the largest ships of war. Alexander carried into execution the designs of Catharine, and appointed the Duc de Richelieu governor of the city. It is fortified in the modern style. The port, which is artificial, is capable of receiving 300 vessels. The roadstead is extensive, and the anchorage is safe in summer, being sheltered from every wind except the south-east. The streets are straight, wide, and cross each other at right angles; there are some fine walks, two public gardens, and numerous public buildings. Water was scarce, but has been supplied by aqueducts. There are many institutions for education here. The commerce of Odessa has been increased by that of Kherson being diverted to it, in consequence of the river approaches to the latter town becoming too shallow. Kherson has consequently become an entrepot for Odessa, forwarding goods in small craft to that port for export. Odessa is abundantly supplied with grain from the country between the Dniester and the Dnieper; wool, timber for naval purposes, hemp, flax, &c., are in addition to grain among the staple exports, and recently coal and iron have been added. The export of grain and seeds for the year 1882 amounted to 4,278,000 imperial quarters as against an average of 2,951,300 in the five years 1872–76. The total value of the exports in 1882 was £11,000,000; that of the imports, £4,025,000. In 1876 the total value of each was about £7,500,000. British vessels have the chief part of the carrying trade in the Black Sea to and from Odessa. Besides the maritime trade, Odessa carries on a large overland trade with Germany, Austria, France, Switzerland, and Italy. Greeks, Italians, French, Poles, Armenians, and Germans are among the inhabitants. Government has endeavoured to induce settlers from Germany to occupy the lands in the neighbourhood of Odessa, by granting them certain privileges. Bulgarian and Russian peasants are also numerous. Odessa was partially bombarded in 1854. Pop. (1882), 217,000.

ODIN. See NORTHERN MYTHOLOGY.

ODOACER, the first barbarian king or ruler of Italy after the fall of the Western Empire, 476 to 493. He was the son of Edecon or Eticho, a secretary and ambassador of Attila, and the hereditary head of the tribe of Sciri, who distinguished himself in the final struggle of this tribe with the Ostrogoths, which led to their defeat and dispersion. Edecon left two sons, Onulf, who went to Constantinople, and Odoacer, who, after leading a wandering life among the barbarians of Noricum, proceeded to Italy, and took service in the imperial guards. He is said, before taking this step, to have visited the cell of Severinus, a popular saint, who predicted his future greatness. The armies of the Western Empire were at this time recruited from among barbarians, who were styled confederates. Orestes, who had acquired the chief command of these troops under the Emperor Nepos, persuaded them to revolt against the emperor, and to acknowledge his own son, Romulus Augustulus, as emperor of the West. As a reward for this successful revolution the troops peremptorily demanded that a third part of the lands of Italy should be distributed among them. Orestes refusing to comply with this demand, Odoacer offered himself to the confederates as their leader in enforcing it. They flocked to his standard from all parts of Italy, and Orestes, deserted, was besieged in Pavia, and on the capture of the town he was taken and executed. Odoacer was saluted as king by his troops, but he did not assume the purple or the imperial title. The senate of Rome gave him the title of patrician, and requested the Emperor of the East, whom they recognized as sole emperor, to allow him the administration of the diocese of Italy. Augustulus fell into the hands of Odoacer, who allowed him to retire to the castle of Lucullus in Campania, and gave him a pension of 6000 pieces of gold. He distributed the promised third of the lands of Italy among his followers, a measure which was probably politic, and calculated to confirm his power. Odoacer, though an Arian, tolerated the orthodox Catholics, and was on the whole a vigorous and successful ruler. He conquered Dalmatia and Noricum, and restored some measure of peace and prosperity to Italy, to which he even transplanted numerous captives taken in his war with Fava, king of the Rugians. He restored the consulship, but refused himself to fill that dignity. The civil laws of the empire were observed and exactly enforced. Italy had, however, already been reduced to a state of extreme misery, and the population, from the want of agricultural industry, was on the decline. In 489, two years after the conquest of Noricum, Italy was invaded by Theodoric, the leader of the Ostrogoths in the service of Zeno, emperor of the East, who had consented to, perhaps suggested this invasion, in order to rid himself of his too formidable ally. Theodoric had been opposed in his progress to Italy through Dacia and Pannonia; but, overcoming all obstacles, he at length crossed the Julian Alps with his followers, who consisted not only of warriors, but of their wives and families, and constituted an armed emigration. Odoacer met the invaders at the river Isontius (Isonzo), where he sustained a defeat (28th Aug. 489) which gave Theodoric the possession of Venetia up to the walls of Verona. After two subsequent defeats at Verona, 27th Sept. 489, on the Addua (Adda), 11th Aug. 490, Odoacer was besieged in Ravenna. After a siege of nearly three years a treaty was concluded (27th Feb. 493) by the intervention of the Bishop of Ravenna, in which Odoacer and Theodoric agreed by an oath to reign jointly over Italy. The Ostrogoths were then admitted into the city. A few days afterwards (5th March, 493) Odoacer was assassinated at a solemn banquet by the order of his rival. His son shared his fate, and a massacre of his followers was perpetrated at the same time.

ODONTOPHORE, the so-called 'tongue' or masticatory apparatus found in the mouth of the three classes of higher molluscs—the Gasteropods, Pteropods, and Cephalopods—which are thus collectively known as the Odontophora. This structure consists of a gristly portion, which supports a ribbon or strap-like band provided with flinty or siliceous teeth variously disposed in a transverse manner. This lingual ribbon is put in motion by means of appropriate muscles, and rasps down in an effective manner the food substances of these Molluscs. See MOLLUSCA.

ODOUR. See NOSE and SMELL.

ODYSSEUS. See ULYSSES.

ODYSSEY. See HOMER.

ŒCOLAMPADIUS, JOHANN, after Zwingli the most distinguished promoter of the Reformation in Switzerland, was born of a Swiss family at Weinsberg, in Suabia, in 1482. His proper name was Heussgen or Hussgen (not Hausschein), which, ac-

cording to the custom of the time, he converted into Œcolampadius. He was destined by his father to the study of the law, which he followed at Heidelberg and Bologna, but inclination led him to theology, which he afterwards studied at Heidelberg. After the termination of his academical course he became first tutor to the sons of the elector-palatine, and afterwards preacher at Weinsberg. He resigned this situation, and went to Stuttgart, where he devoted himself to the study of Greek under Reuchlin, and of Hebrew under Matthew Adrian. In 1515 he received through Capito a call as a preacher to Basel. Here he became acquainted with Erasmus, who esteemed his classical attainments so highly that he availed himself of his services in editing his New Testament. In 1516 he accepted a call as a preacher to Augsburg, but soon afterwards entered a monastery in Altenmunster. From this retirement he was soon called forth by the proclamation of the doctrines of Luther, which he embraced. He accepted the appointment of preacher to Franz von Sickingen at his castle of Ebernburg, and on the death of Sickingen he returned to Basel (1522), where he began his public career as a reformer, in the capacity of a preacher and teacher of theology, and promoted the reformation already begun there by Capito. He disputed with defenders of the church at Baden in 1526, and at Bern in 1528. In the latter year he completed the establishment of the Reformation at Basel and Ulm. In the dispute between Luther and Calvin about the Lord's Supper, Œcolampadius took substantially the view of Zwingli. With him originated the exegetical exposition of the typical interpretation of the words of institution, which in 1525 he gave forth in his work De genuina Verborum Domini hoc est Corpus meum interpretatione. The Swabian preachers replied to this book by the Syngramma Suevicum. Œcolampadius afterwards disputed with Luther at Marburg in 1529. He died at Basel, 24th November, 1531. Among the works which he wrote in furtherance of the Reformation are De ritu paschali, and Epistola canonicorum indoctorum ad Eccium. His biography was written by Hagenbach (Elberfeld, 1859).

ŒCUMENICAL (Greek, *oikoumenikos*, of or pertaining to the whole inhabited world), universal, an epithet generally applied to the general councils of the church. An œcumenical council was one to which all the bishops of the church throughout the world were invited. In Africa the term œcumenical was applied to a council to which all the African bishops were invited; and in the Roman Catholic Church it is applied to a council convened by the pope, and to which all the Roman Catholic bishops are invited. In the case of the first œcumenical council, that of Nicæa, the emperor and not the pope was the convener. From the time of the Council of Chalcedon (451) the patriarchs of Constantinople took the title of œcumenical, in the same sense as the epithet Catholic is used in the Western Church. See COUNCIL and NICE (COUNCIL OF).

OEDEMA, a swelling occasioned by the infusion or infiltration of water or serum in cellular structures. Oedema is a symptom, and frequently a serious one, in various diseases. The sub-cutaneous cellular tissue is the most frequent, but not the only seat of oedema. The other forms which are most frequently recognized during the life of the patient are oedema of the lungs and of the glottis. Oedema of the brain is of less frequent occurrence and less easily recognized, and oedema of the sub-mucous and sub-cellular tissue seldom produces symptoms sufficiently decisive to determine their nature.

Oedema is divided into two classes, active or warm and passive or cold oedema. The latter is distinguished by pallor and coldness of the surface, and by exhibiting a want of elasticity after pressure; the active or warm oedema is less common than the cold. It is sometimes associated with the weak inflammatory action called *hydro-phlegmasia*, and is a frequent attendant of erysipelas. The swollen surface is coloured as well as warm, and it does not yield so readily to the touch as the cold swelling.

Cold oedema may arise from an obstruction of some of the veins, from varicose veins, from weak action of the heart or muscles, or from superabundance of water in the blood. The serum may be either fluid or gelatinous. Warm oedema is always a form of inflammation of the cellular tissue, and the serum is more commonly yellow or sanguineous. Oedema of the glottis is a form of laryngitis, otherwise called simple asthenic laryngitis. Oedema of the lungs is associated with heart disease, with other diseases of the lungs, or with obstructions of the kidneys, liver, &c. Oedema, associated with erysipelas, deep-seated suppuration, or a morbid state of the circulation, is attended with great danger. The treatment of oedema depends upon the disease of which it is symptomatic.

OEDENBURG (*Hung.* SOPRON), a town in Hungary, capital of the county of the same name, on a plain near the south-west shore of Lake Balaton, 36 miles S.S.E. of Vienna. It is tolerably well built, and has several churches, a Roman Catholic and an Evangelical gymnasium, a town-house with the highest tower in Hungary, and containing some good pictures. Its manufactures are woollen, linen, and cotton cloth, sugar-refining, cutlery, glass, and earthenware; and the trade is in these, and in corn, cattle, wool, wine, &c. Several of the fairs are important. Many Roman antiquities have been found here. Pop. (1880), 23,222.

ŒDIPUS, son of the Thracian king Laius and Jocasta. (See JOCASTA.) An oracle had announced to Laius that his child by Jocasta should be his murderer. When, therefore, a son was born to him he ordered a slave to bore his heels and expose him on Mount Cithæron. But the slave gave the child to a shepherd of the Corinthian king Polybus, and the shepherd carried him to the king, whose wife, Merope, being without children, received him, and called him *Œdipus*, from his swollen feet. Ignorant of his birth, the child grew up at the Corinthian court with all the qualities of a hero. But an angry youth having one day reproached him with not being the son of the king, he became a prey to tormenting doubts. His foster parents, whom he questioned, referred him to the Delphian oracle, which gave him this answer—'Avoid the soil of thy country, or thou wilt be the murderer of thy father, and the husband of thy mother.' As he looked upon Corinth as his country he left it, and travelled to Thebes, in Bœotia. In a narrow road in Phocis he met King Laius, who was going to Delphi to consult the oracle with regard to the son whom he had exposed; and the king's charioteer haughtily ordered him to get out of the way. Œdipus refused to obey; a struggle ensued, and both king and charioteer fell under his sword. Thus he had unconsciously fulfilled one half of the oracle. Ignorant of this he pursued his way. The territory of Thebes was at that time desolated by the Sphinx (see SPHINX), who, establishing herself on a rock, put a riddle to every Theban who passed, and put to death every one who failed to solve it. In this extremity the vacant throne and the hand of the queen were offered to the deliverer of Thebes. Œdipus comes forward, solves the enigma, delivers the city, and receives the prize. The oracle was thus fulfilled. Thebes now honoured within her walls the murderer of Laius, when a pestilence fell upon the land, from which the oracle promised deliverance as

soon as he was removed who had called down this curse. The affrighted people again have recourse to their former benefactor, and he, unconscious that he is himself the criminal, strives with restless zeal to discover him. He draws from the prophet Tiresias the unhappy secret, and makes the horrible discovery that he is the murderer of his father and the husband of his mother. Cursing the bed in which she had borne a husband to her husband, and a son to her son, the unhappy Jocasta hanged herself. Œdipus put out his own eyes to extinguish the sight of all which could remind him of his guilt. He begged the Thebans to banish him. At a later period, when he wished to die in Thebes, he was driven away by his ambitious sons Eteocles and Polynices. In his anger he cursed them, and threatened that the sword should divide their inheritance. His two daughters, Antigone and Ismene, followed their blind and exiled father. Led by the former he reaches the village of Colonos, in Attica, where Theseus reigned, and dwells in the grove of the Eumenides, which no mortal foot dared approach. He conciliates the favour of the terrible goddesses. The people and Theseus took him under their protection. In the meanwhile the oracle of Pythian Apollo had declared that the land which should ignorantly conceal his ashes would be fortunate and invincible. The inhabitants of Thebes now endeavoured to draw him back. Impelled by the presentiment of approaching death, he sought his grave, accompanied by Theseus alone. The gods were reconciled to him. His death was the death of suffering innocence. The ancients have disagreed with regard to his burial-place. Tradition varies as to the incidents of this history, and the tragic poets, by whom it has been much used, have embellished it in a variety of ways. The Œdipus of Æschylus and that of Euripides are lost. Of Sophocles two pieces treating of his fate remain—King Œdipus and Œdipus at Colonos. Seneca has also written a piece on the same subject.

OEHLENSCHLÄGER. See Öhlenschläger.

OELS, a town of Prussia, in the province of Silesia, 17 miles north-east of Breslau, on the Oels. It is walled, has a castle built in the form of a square; several churches; a gymnasium, synagogue, hospital, poor-house, several schools; manufactures of paper and woollen, linen, and silk goods; and several oil and other mills belonging to the Duke of Brunswick. Pop. 10,157. Oels is the capital of a principality in the government of Breslau, which, in 1792, was mediatized under Würtemberg, from which it was transferred to Brunswick Wolfenbüttel. It comprises 808 square miles, and has a population of 130,000.

ŒNANTHOL, $C_7H_{14}O$, a substance produced by the dry distillation of castor-oil; it forms a colourless mobile liquid from which a series of derivatives are prepared, such as œnanthylic acid $C_7H_{13}O.HO$, œnanthylic ether $C_7H_{13}O.C_2H_5O$, &c.

OERSTED'S EXPERIMENT. The effect which the discharge of frictional electricity has in creating, destroying, and reversing the magnetism of needles was studied long ago by Franklin, Beccaria, Wilson, Cavallo, and others. Professor Oersted of Copenhagen published in 1819 a discovery which showed magnetism and electricity to be most intimately connected. This was the directive action which a current exerts on a suspended needle. If left free to move in a horizontal plane, a magnetic needle will remain at rest only in the magnetic meridian. Now if a wire is placed above or below the needle and parallel to it, and if a current of electricity be sent through it, the needle is no longer found to be in equilibrium in the magnetic meridian; it comes to rest in a position making an angle with its previous position, and as the current is made stronger and stronger the needle tends more and more to make a right angle with its previous position. To impress on the memory the directions of deviation of a needle under the influence of a current, Ampère devised the following formula:—Let any one identify himself with the current, or let him suppose himself to be lying in the direction of the positive current, his head representing the copper, and his feet the zinc plate of the galvanic cell, if he looks towards the needle its north pole will always move towards his right hand. Oersted's discovery became, in the hands of Ampère and Faraday, the source of a new branch of natural philosophy.

OESEL, an island, Russia, government of Livonia, in the mouth of the Gulf of Riga, and after Seeland the largest island in the Baltic; area, 1998 square miles. Its coast is generally bold and its interior undulating. The climate is much milder than on the adjoining mainland, the winter is not so cold nor the summer so hot. In harvest time violent storms prevail. The soil, gravelly and not naturally rich, becomes productive by careful culture, and raises corn for export, hemp, and flax. The pastures are good, the forests large, and the fisheries valuable. Pop. 46,000.

ŒSOPHAGUS, or Gullet, the membranous and muscular tube which leads from the pharynx or back part of the mouth to the stomach. The human gullet possesses an external layer of muscles composed of longitudinal and circular fibres. Internally the gullet is lined by mucous membrane, and between the mucous and muscular layers cellular tissue exists. The muscular fibres of the œsophagus are of the unstriped or involuntary kind, and the mucous or lining membrane is thick and of pale colour, and is arranged in longitudinal rugæ or folds. It is covered by a thick layer of epithelial cells of the squamous or scaly variety. The so-called *œsophageal glands* are small glands of compound nature, which exist in the submucous tissue of the mucous membrane. Their function is apparently that of furnishing the mucous secretion of the tube. The length of the gullet is from 9 to 10 inches. It begins at the fifth cervical or neck vertebra, at a point corresponding with the cricoid cartilage of the larynx, and it runs in a slightly deviating course downwards to the stomach. Thus in the neck it lies on the left side of the windpipe; whilst in the chest it bends to the right side and then to the left before it pierces the midriff or diaphragm —which forms the floor of the chest—by a special aperture existing in that structure. The gullet is supplied with blood chiefly by the inferior thyroid arteries and the œsophageal branches of the aorta. Its nervous supply is derived partly from the pneumogastric nerves and partly from the sympathetic system.

In fishes the gullet is short, wide, and distensible; and the latter property is specially seen in serpents, which are thus enabled to swallow prey of large bulk. In the tortoises and turtles it is provided internally with horny processes of a recurved shape; in birds it is furnished with a single or double sac-like pouch, the *ingluries* or *crop;* and in the dormouse, among mammals, a crop-like dilatation exists at the lower portion of the gullet. In some forms, as in the opossum, &c., a valvular fold exists at the inferior opening of the gullet into the stomach; and in the horse this valve is of so perfect a nature that these animals are incapable of vomiting. Food is propelled along or down the œsophagus by the vermicular or peristaltic action of its muscular walls, a kind of wave-like action also seen in the movements of the intestines.

ŒSTRUS. See Gadfly.

ŒTA, a mountain in ancient Greece, forming the south boundary of Thessaly, and separating that country from Central Greece. At its east extremity was the pass of Thermopylæ, the only entrance into Central Greece from the north. See THERMOPYLÆ.

OFEN. See BUDA.

OFFA'S DYKE, a rampart or boundary extending from the vicinity of Newmarket, in Flintshire, traversing the counties of Flint, Denbigh, Salop, Radnor, Hereford, and Monmouth to Beachley, at the mouth of the Wye. It is said to have been erected by King Offa, in the eighth century, as a boundary between his dominions and those of England. There is another dyke of a similar kind called Watts' Dyke, which runs at distances of from ¼ mile to 3 miles apart from Offa's Dyke, in the same direction, through the counties of Flint and Denbigh. This has given rise to another conjecture as to the origin of these dykes, namely, that they were intended to mark the neutral ground on which the Danes and Britons were at liberty to meet for transacting business.

OFFENBACH, a town in the Grand-duchy of Hesse, 5 miles E.S.E. of Frankfort, on the left bank of the Main. It is partly walled and well built, and has an old castle, formerly the residence of the princes of Isenburg, the palace of the Prince of Isenburg-Birstein, several churches, a synagogue, and theatre. There are numerous benevolent and other trade associations. Offenbach is the most active manufacturing town in the state, and one of the most important in Germany. Besides woollen, silk, and cotton goods, works in leather and steel, as belt-making, portfolio and travelling bag manufactures, there are manufactures of aniline, gas and tar products, iron-casting and machine-making, extensive manufactures of boots and shoes, type-founding, printing, carriage spring and axle making, and white-lead and other manufactures. The trade in these and also in wine is considerable. Pop. (1880), 28,597.

OFFENBURG, a town of Baden, circle Mittelrhein, on a hill near the right bank of the Kinzig, 12 miles south of Carlsruhe. It is walled; has a town-house, merchants'-hall, gymnasium, nunnery, and well-endowed hospital; manufactures of mops and glass, tanneries, and several mills. Pop. 7274.

OFFERINGS and SACRIFICES are gifts offered, properly with some symbolic intent, to the Deity. Sacrifice differs from almsgiving as a religious service, or from contributions made merely for the purpose of supporting a system of external religious observances, in being offerings made not merely for the sake of religion, but directly from the worshipper to the superior being to whom his worship is directed, although these offerings may afterwards, according to the will of that being, or of those by whom his worship is directed, be applied to charitable or religious uses; to the maintenance of the priesthood, or to the celebration of solemn feasts in which the worshipper and his friends, together it may be with the priests, and under the presiding presence of the Deity may partake. That the symbolic character is the properly distinctive attribute of sacrifice in its general significance is evident; for although some very rude or degraded peoples have imagined deities having either physical wants to be supplied by sacrifice, or perhaps more commonly, a cruel disposition to be gratified by it, yet without some higher conception than the literal one of the meaning of sacrifice, it would never have been so widely spread or so firmly established among polished nations as it has been.

The origin of sacrifice is a point much disputed; the two opposed views being that of a primeval appointment by the Deity, and that of a spontaneous origination in the instinctive desire of man to draw near to God. The universality of sacrifice has been urged in favour of the hypothesis of a primitive institution by Divine command, but the more legitimate inference from this circumstance appears to be in favour of the opposite view. It is hard to imagine that any primitive institution could have been maintained among men scattered as they have been for so many ages over the earth, frequently without any other trace of an early civilization, and differing from each other in so many respects in all their manners, customs, and traditions. If, however, there is any common and spontaneous instinct in man directing him to the recognition of the Deity, it is easy to conceive that it should operate in similar or analogous modes under all the varieties of circumstance. A question may arise, if sacrifice originated spontaneously in the instinct of human nature, why it should have ceased in many civilized societies to prevail. This is obviously too wide a question to enter upon here; a general observation may, however, be made. Cultivated reason controls, if it does not suppress, many of the original instincts of men. It has frequently led to the rejection of all positive forms of religion, and it may very well substitute some other mode of manifesting the religious instinct than that which earliest and most spontaneously presents itself. This determination is supported also by the institutions of some positive religions as Mohammedanism, and at least the Protestant form of Christianity.

Of the symbolic character of sacrifice there are various kinds or degrees, all having in common the acknowledgment of dependence on the one hand and of protective power on the other. These may be represented under three heads—1, propitiatory, or designed to conciliate generally the favour of the Deity; 2, eucharistic, or symbolical of gratitude for favours received; 3, expiatory, or offered in atonement for particular offences. To a different class may be assigned deprecatory sacrifices designed to avert the arbitrary wrath or appease the wicked disposition of deities.

Among the customs of various peoples in regard to sacrifice, those of the Jews stand out as pre-eminently worthy of attention, first because of their very express and explicit claims to a divine origin; secondly, because of their singular and remarkable character; and lastly, because of their connection with the Christian religion. The origin of the Jewish sacrifices is traced to the earliest times. We are told in the book of Genesis (chap. iv.), that 'in process of time' Cain and Abel brought each an offering to the Lord, and the different characters and results of these offerings are recorded. After the flood Noah offered a sacrifice 'of every clean beast and of every clean fowl,' an apparent intimation that the distinction between clean and unclean animals had already been made, and consequently of a prior divine appointment of sacrifice. Abraham, Isaac, and Jacob offered sacrifices in which appeared a circumstance peculiar to the Jewish economy, that of a covenant between the offerer and the Divine being, of which the sacrifice was accepted as a sign. When Moses demanded the manumission of the Israelites from their bondage in Egypt, the plea which he presented to Pharaoh was that they might go three days' journey into the wilderness to sacrifice to the Lord. It was when the deliverance had actually taken place, and during their sojourn in the wilderness, that the Jewish ceremonial law with its elaborate ritual of sacrifice was given. Into the details of this ritual with its surrounding observances of festivals and of the cleanness and uncleanness in men, animals, and things, so amply detailed in the book of Leviticus,

we cannot enter. The burning upon the altar of animals offered in sacrifice is among the commonest of the forms of sacrificial rites both among the Jews and Gentiles. The Jewish sacrifices consisted mainly of burnt-offerings (of clean animals) daily, with double offerings on sabbaths, and special offerings at festivals, unlimited in extent, and which, being partaken of by the people, were called peace-offerings. Such sacrifices, called hecatombs, were also common among the Greeks and Romans. Meat-offerings (of flour, oil, and wine) accompanied the burnt-offerings. Sin-offerings (various) at special feasts and at each new moon were general expiatory offerings, besides which trespass-offerings were made privately on certain specified occasions, as well as in expiation of particular offences. The most remarkable sin-offering was the well-known one of the two goats on the great day of atonement. Incense was offered every morning and evening. Offerings were made separately, first for the priests and afterwards for the whole people. What is most remarkable about the Jewish sacrifices was their restriction to one particular place, first the tabernacle, and afterwards the temple. Offerings on high-places were forbidden, and are always noticed with reprobation as the indication of a rebellious spirit. The view of Maimonides among the Jews, and of Warburton and others among Christian divines, was that sacrifices were not so much divinely appointed, as divinely permitted under restraints among the Jews, 'lest,' as it is expressed by Ephraim Syrus, 'they should despise a naked religion and attach themselves to false gods.' It is added in support of this view, that when religion was more fully established the prophets constantly deprecated sacrifice, but this is hardly a fair account of what the prophets did. The prophets, indeed, with one voice unite in affirming the views of sacrifice represented by Samuel in his exhortation to Saul, that 'to obey is better than sacrifice,' and of our Lord, who, according to Saint Matthew, repeatedly cited the authority of the prophets for the saying that God will have mercy and not sacrifice, but it is clear that these statements were not directed against the established usage of sacrifice, but against an unreasonable reliance on them as a substitute for moral virtues.

Of the sacrifices of the Gentile nations space will not permit us to say much. They were evidently, as has been said, in many cases at least, the result of natural impulses developed by tradition, or cultivated by priestly care into a system. The powers of nature, or the most prominent objects, celestial or terrestrial, in which those powers resided, were commonly their exciting causes. The imagination following the dead gave supernatural powers to departed heroes and benefactors; the secret and often marvellous changes of nature peopled the wood, the field, the mountain, and the ocean with mysterious beings by whom these changes were effected; and finally, the terror of natural convulsions, and still more the disorders and miseries of human life conjured up malevolent beings, whose wrath was only to be deprecated by blood, and sometimes by the blood of those dearest to the offerer. Here, again, human ingenuity came into play, and not animals alone, but slaves and captives, were sacrificed freely to redeem the lives of friends and kindred. Among many of the eastern nations surrounding the Jews human sacrifices were common. They were so particularly among the Phœnicians. Some traces of this barbarous custom may be found in legendary times even among the Greeks and Romans. Numerous legends hang upon the circumstance that the wrath of some divinity is only to be appeased by the sacrifice of a human victim to be recognized in some special way, or sometimes of a continued series of such victims. In one other respect only do the heathen sacrifices, including those of the Greeks and Romans, demand special notice, as differing materially from those of the Jews in the frequent inclusion among them as a sacrifice acceptable to the Deity of the chastity of women. This is always denounced in the strongest terms by the Hebrew prophets. The sacrifices of the Greeks and Romans, like those of the Jews, were either bloody or bloodless, the former usually accompanied by libations of wine and by incense. They were frequently used as a means of consulting the gods, procuring omens, &c., and consequently for political purposes.

Of the universality of sacrifice the annals of almost every people bear record. The ancestors of nearly all the existing races in Europe practised human sacrifices, and similar usages widely prevailed in Africa and America, as well as in Asia. Few religions, whether ancient or modern, have omitted sacrifices from among their rites. The Buddhists offer only first-fruits and flowers; the Mohammedans give alms, but offer no direct sacrifices. The Roman Catholic and Greek Churches offer a mysterious sacrifice in the mass. (See also OFFERTORY.) Protestants, with the exception of a small body of Anglican churchmen, admit of no sacrifice but that of inward personal dedication. Two sacraments, however, those of baptism and the Lord's supper, have, in the Protestant view of Christianity, superseded the outward ceremonial of sacrifice. The introduction of Christianity had the effect of indirectly putting an end to Jewish sacrifices, and of directly abolishing heathen sacrifices in the Roman Empire. These were prohibited by the Emperor Theodosius in 381.

OFFERTORY, in the Roman Catholic Church, is that portion of the service of the mass in which the priest offers to God upon the altar the bread and wine which are to be consecrated. Formerly the offertory divided the mass into two parts, the former was called the catechumen's mass, because immediately before the offertory the catechumens and those who were under the public performance of penitence were dismissed, when the second mass, or mass of the faithful, commenced with the offertory. In the ancient church too the custom prevailed, particularly in Milan, of the faithful bringing gifts in kind which they laid themselves upon the altar. These gifts consisted first in bread and wine for the service, which were regarded as of the nature of an oblation rather than of alms; but besides this other offerings were added either in kind or in money, for the *agape* or feast which attended the celebration of the Eucharist, for the support of ministers, and for the relief of the poor. Subsequently the gifts in kind were commuted into gifts in money, and were laid on the altar not by the people themselves but by the minister. This form is still observed in the Church of England, and is regarded by some Anglican divines as constituting an oblation or offering to God of the material substance for sacrifice.

In the music of the mass the term offertory is used to designate the portion of the music appropriated to that part of the service above designated.

OFFICE, DIVINE, in the Roman Catholic Church, is used as a general designation for the entire complement of services, consisting of lessons, song, and ceremonies, which constitute the established order of celebration of public worship. These offices are principally contained in the Missal, which contains the rites and prayers of the mass throughout the year; and the breviary, which contains the service appointed to be used at the canonical hours, and is the ordinary service-book for daily use throughout the year. (See BREVIARY, MISSAL.) The Western offices are gene-

rally allowed by authorities to be modifications of older offices used in the Eastern Church, and there seems good reason to believe that these in their earliest forms were based in part at least upon the order of service in the Jewish synagogues, and probably modified by the peculiar circumstances of the Christian church in times of persecution, which may account for the introduction of nocturnal services. The institution of canonical hours (see that article) is mentioned in the apostolical constitutions, a compilation of various dates, probably extending from the second to the fifth century. The hours of the day were similar, divided by fixed periods for prayer, in the Jewish ritual; and there are various passages in the Acts of the Apostles which show that the apostles conformed to this usage. This may possibly have been merely in accommodation to the custom of their countrymen, but it seems highly probable that their practice in this respect may have originated or suggested the usage of the church. The large use of psalms in the early offices is another point of resemblance with the synagogue worship. Lessons were introduced at a later period. For the history of the various offices see LITURGY.

OFFICE, HOLY. See CONGREGATIONS.

OFFICERS, MILITARY and NAVAL. The officers of the army are distinguished in various ways, as commissioned and non-commissioned, staff and regimental, combatant and non-combatant. The officers of the general staff comprise the commander-in-chief and the subordinate generals, each of whom when in separate command has his own particular staff, that is to say, all the officers who are engaged in directing the movements of bodies larger than a regiment. There is also a regimental staff consisting of the higher officers of the regiment.

A general in independent command is assisted by an adjutant-general and a quarter-master general. The adjutant-general, with his assistants, takes account of the strength of the army, and distributes the orders of the general. The quarter-master general with his assistants arranges the quarters of the army and orders its marches.

The various grades of general officers in the British army are field-marshal, general, lieutenant-general, and major-general. The queen is by the British constitution the supreme commander of the whole army. Such powers as are necessary for the ordinary government of the army in time of peace are delegated to the field-marshal commanding-in-chief, under whom are the generals commanding in the various military districts in Great Britain and the colonies. The officers having the chief military command in each presidency of India and in Ireland are also styled commanders-in-chief, and exercise to some extent an independent authority, although all are subject to the field-marshal commanding-in-chief; and the commanders-in-chief in Bombay and Madras are subject to the commander-in-chief in Bengal.

The combatant regimental officers are the colonel, who is in the British army only the nominal commander, being always a general officer; the lieutenant-colonel, who is the active commander of the regiment; the majors, of whom there are two to each regiment; captains, one to each company, and a number of lieutenants (formerly ensigns or cornets); and the non-commissioned officers, including various grades of sergeants and corporals. The staff of a regiment includes the colonel, lieutenant-colonel, major, adjutant, pay-master, quarter-master, inspector of musketry, and medical officers. The master-gunners and schoolmasters in the army hold their office by warrant in place of commission, and are called warrant-officers.

The officers in the navy are distinguished as commissioned, warrant, and petty officers. The commissioned officers include admirals, vice-admirals, rear-admirals, captains, commanders, lieutenants, sub-lieutenants, chaplains, engineer officers, medical officers. Warrant-officers include boatswains, carpenters, gunners, &c. The petty-officers are equivalent to the non-commissioned officers in the army. They comprise the principal artificers among the seamen, to whom the care of various departments of work necessary for its good order and safety is intrusted.

OFFICIAL, by the ancient law, signifies him who is the minister of, or attendant upon, a magistrate. In the canon law it is especially taken for him to whom any bishop generally commits the charge of his ecclesiastical jurisdiction in matters of contention.

OFFICINAL (Latin, *officina*, a workshop), in pharmacy, the name applied to the recipes admitted into the pharmacopœia, and in particular to the species of plants used in the preparation of recognized medical recipes.

OFFING, a nautical term signifying the position of a vessel, or of a portion of the sea within sight of land, relatively to the coast. The offing may be taken to represent that part of the sea beyond the mid-line between the coast and the horizon.

OFFSETS, in gardening, those young shoots that spring from the roots of trees or plants, which, being carefully separated and planted in a proper soil, serve to propagate the species.

OFTERDINGEN, HEINRICH VON. See MINNESINGERS.

OG, king of Bashan, mentioned in the Bible, has been transformed by rabbinical fables into one of the giants who lived before the flood, and escaped the general inundation by taking refuge on the roof of Noah's ark. Noah fed him there, less through compassion than that he might be to men of after times a proof of the power of God, who had created and destroyed from the face of the earth such monstrous creatures. In the war of Og against the Israelites he lifted up a mountain 6000 paces in circuit, and was about to throw it down upon the camp of Israel when it was pierced through by ants sent by God and fell upon him. At the same moment his teeth grew so quickly that they entered the mountain and held him fast, so that Moses could kill him without difficulty. To give an idea of his gigantic size, the rabbins say that Moses, who according to their account was 6 ells high, and had a battle-axe of the same length, was obliged to make a leap of 6 ells in order to strike his ankle-bone. He bled to death of the wound.

OGDENSBURG, a town and river port of the United States, in New York state, 200 miles N.N.W. Albany, on the right bank of the St. Lawrence, at the mouth of the Oswegatchie. It is regularly laid out and well built; is at the lower limit of sloop navigation, but steamers go to the rapids 40 miles farther down. It is a place of very extensive trade, being an entrepôt for goods from and to the upper lakes and Canada. Pop. (1880), 10,341.

OGEE, in classic architecture, is a moulding consisting of two members, one concave and the other convex. It is also called a *cyma reversa*. An *ogee arch* is a pointed arch, the sides of which are each formed with a double curve. It is generally introduced over doors, niches, tombs, and windows, its inflected curves weakening it too much to permit of its application for the support of a great weight.

OGHAMS, an ancient alphabet formerly in use among the Celtic peoples of Ireland, Scotland, and Wales, chiefly found in inscriptions on stone, but also, though more rarely, in books. Oghams consists chiefly of straight lines, mostly vertical and oblique,

horizontal lines and curves being sparingly used. They derive their significance partly from their position on a continuous horizontal stem-line along which they are written, some of the characters being drawn resting on the horizontal line as a base, others depending from it, and others intersecting it. Authorities differ as to the total number of letters represented in the alphabet, some making sixteen, others twenty-five, in five groups of five each, named after their initial letters. According to the various modes of reading suggested, these letters are represented by about eighty characters, making up several alphabets of which there are various interpretations. According to that of the Rev. Charles Graves of Dublin, one of the scholars who have bestowed most study on them, a single vertical stroke resting on the line represents *h*; two contiguous strokes *d*; three *t*; four *c*; five *g*. A single horizontal stroke depending from the line *b*; two *l*; three *f*; four *s*; five *n*. The letters *m*, *g*, *ng*, *x*, *r*, are represented by one to five oblique strokes right to left crossing the line; the vowels *a*, *o*, *u*, *e*, *i*, by one to five vertical strokes crossing the line. Diphthongs are represented by curves or compound letters.

The age of this alphabet has been the subject of a good deal of discussion. The best authorities seem now to be agreed that it cannot be traced beyond the introduction of Christianity. The object of its construction seems not to be explained. Oghams are found chiefly in Ireland, but some have been found also in Scotland, Wales, the Shetland Islands, and even in England. The Celtic names in the inscriptions are frequently Latinized. There are several hundred wood-cuts of oghams in the library of the Royal Irish Academy. The British Museum has four ogham stones. There are numerous publications regarding them in the archives of archæological societies.

OGOBAI (German, *Ogowai;* French, *Ogooué*), a large river on the western coast of Africa, in the French colony of the Gaboon. It has a wide delta through which it flows amidst dense forest, where are the haunts of the gorilla and other anthropoid apes. Du Chaillu found the main stream, about 150 miles from the mouth, divided into two streams, the Okanda and the Ngouyai, the former coming from the north-east, the latter, which alone was explored by Du Chaillu, from the south-east. This branch passes through a series of rapids, but is navigable for steamers both above and below them. A French expedition (the second), headed by M. Savorgnan de Brazza, started for the Ogobai in 1875, and returned towards the end of 1878, after exploring the other, which is the main branch, to where it becomes an insignificant stream, and proceeding thence some distance further into the interior. The main result of the expedition was the determination in the negative of the question of the communication of the Ogobai with the great lakes of Central Africa.

OGYGES, in Greek mythology, is mentioned as the most ancient ruler of Attica, then called *Aktē*. The Athenians call him a native of the country. According to other accounts he was king of the Hectenes, the original inhabitants of the country, first called *Ogygia*, and afterwards *Bœotia*, from the Bœotians. Even the building of Thebes is ascribed to him, and one of the gates of the city was named after him. The gate, however, is also said to have been so called from Ogygia, a daughter of Amphion and of Niobe. Under the reign of Ogyges happened the Ogygian deluge, which laid waste all Attica. In the reign of the Theban Ogyges a deluge also took place in Bœotia, from the Lake Copais rising and overflowing its banks. The island of Calypso was also called *Ogygia*. See CALYPSO.

OHIO, a river in the United States of America, formed by the confluence of the Alleghany from the north and the Monongahela from the south, at Pittsburg in Pennsylvania, where it is a navigable stream 600 yards broad. It flows W.S.W., separating the states of Virginia and Kentucky on the south from Ohio, Indiana, and Illinois on the north, and enters the Mississippi at lat. 37° N.; lon. 88° 58′ W. Its length from Pittsburg to its junction with the Mississippi, following its windings pretty closely, is 975 miles, but in a direct course it is not more than 614 miles; area of basin, 214,000 square miles. It has a descent in its whole course of 395 feet, making an average descent of not quite 5 inches in a mile. The width of the river varies from 400 to 1400 yards; its average width is about 800 yards. At its mouth it is 900 yards broad. It has no considerable fall excepting at one point, where it descends 22½ feet in 2 miles. Its principal affluents are the Miami, Kentucky, Wabash, Great Cumberland, and Tennessee.

OHIO, one of the United States of North America, bounded on the north by Lake Erie and the state of Michigan, west by Indiana, south by Kentucky, south-east and east by West Virginia, and north-east by Pennsylvania; area, 41,060 square miles. It is very compact in form, and in relation to the more important states of the Union, very centrally situated. In the north, both towards the shores of Lake Erie and in the interior, the surface is generally level, and in some places marshy; in the east and south-east it is rugged and broken by hills, but never rises into mountains. The most extensive prairies are near the sources of the Muskingum in the east, and of the Scioto, near the centre. Rich alluvial stripes are found along the margins of the Ohio and its tributaries, and large level tracts of great fertility in the valleys of the Scioto and of the Great and Little Miami. In its natural state Ohio was covered with dense forests; now there is but about one-fifth, the trees most abundant being several varieties of oak, maple, ash, black and white walnut, chestnut, beech, poplar, sycamore, linden, &c. The drainage is divided between the Ohio and Lake Erie. The former, which receives the far larger share, bounds the state partly on the east and wholly on the south, and is augmented from within it by the Mahoning, Beaver, Muskingum, Hockhocking, Scioto, and the Great and Little Miami; the latter, which washes the northern frontier for 160 miles, receives the Maumee, Portage, Sandusky, Huron, Cuyahoga, Grand, and Ashtabula. The climate in the northern parts is characterized by severe winters and usually a heavy fall of snow; the summers and autumns are mild and agreeable. In the south the winters are very mild, with but little snow; the summers are long and often intensely hot. On the whole the climate is very healthy, and peculiarly favourable for agricultural operations. The chief crops are Indian corn (the staple), wheat, oats, rye, buckwheat, barley, and potatoes. About 35,000 acres are devoted to the growth of tobacco. Horses, sheep, cattle, and swine have long been reared in great numbers for export. Coal and iron are abundant, particularly in the north-east; in 1881 the estimated produce of coal was 8250 tons, and of pig-iron 710,516 tons, the output of 102 furnaces. Salt, marble, limestone, freestone, and gypsum are found in many districts. The more important manufactures are bar, sheet, and railway iron, machinery, hardware, and various articles in metal; leather, woollen cloth, paper, and spirits. Cotton, silk, flax, and mixed goods are also made to some extent. The foreign trade, carried on chiefly with Canada across Lake Erie, is comparatively small; but a very extensive inland trade is carried on both by the Ohio and by numerous canals and railways, which traverse the country in

every direction. On Dec. 31st, 1882 there were 6931 miles of railway open for traffic within the state. Among the higher educational establishments are the university at Athens; several denominational universities and colleges; schools of law, medicine, and theology; the larger towns have graded and high schools, with instruction in German as well as in English; two normal schools are aided by the state; the common schools are numerous and well attended. The legislature consists of a Senate, chosen for two years; and a House of Representatives, chosen annually, both by universal suffrage. It sends twenty-one members to the House of Representatives of the American Congress, and has twenty-three votes in the presidential election. Columbus is the capital, and other principal towns are Cincinnati (the commercial metropolis), Cleveland, Toledo, Dayton, and Springfield. Ohio became a state in 1802, and is now the third in population in the United States. Pop. (1870), 2,665,260; (1880), 3,198,062.

OHLAU, a town in Prussia, in the province of Silesia, 18 miles south-east of Breslau, on the Ohlau, and on the railway to Cracow. It is defended by a castle; has two churches, an hospital, provincial courts and offices; and manufactures of cloth, tobacco, and paper; tile-works, breweries, and distilleries. Pop. (1880), 8395.

ÖHLENSCHLÄGER, Adam Gottlob, one of the most celebrated Danish poets, was born in 1779 at Fredericksberg, near Copenhagen, where his father, a native of Schleswig, was organist, and afterwards keeper of the castle. After attending the principal school he commenced a course of rather desultory reading. At the same time he began with his sister and some companions to perform plays at the castle, but did not entirely neglect his Latin and Greek. His theatricals indeed brought him no laurels, but procured him the friendship of the noble Rahbok and the celebrated player Rosing. Encouraged by them, he now began to adopt a more serious course of life, underwent a preliminary juridical examination in his nineteenth year, and studied law for a short time under A. S. Oersted. On the attack made by the combined English fleet under Nelson and Parker on that of the Danes before Copenhagen in 1801, he served in the student corps. About this time also he gave his attention to living languages and to old northern and Icelandic history. His poetical talent was first displayed in a collection of poems published in 1803, and followed in 1805 by Poetical Writings, in which his Vaulundurs Saga announced the revival of the northern poetry, while his Aladdin exhibited the exuberant fancy and rich colouring of the oriental school in combination with youthful dramatic vigour. In 1807 appeared his Northern Poems, containing among others Hakon Jarl, a work which established his fame. Meanwhile he had in 1805 made a journey to Germany, which had tended greatly to awaken and improve his powers. In Berlin he attended the lectures of Fichte, and made himself so well acquainted with German that he was able to write in it. Schleiermacher made him acquainted with the trimeter and anapæstic measures, and he formed a close friendship with Tieck and Steffens. From Germany he proceeded to France, and spent two years in Paris. He then began to prepare for a journey to Italy, and having reached Tübingen by means of a small loan, secured the necessary amount by selling his German manuscripts to Cotta. In Coppet he resided five months with Madame de Stael, and became acquainted with A. W. Schlegel, Benjamin Constant, Sismondi, and Zachary Werner. In Rome he wrote his Correggio, which had been preceded by his two northern tragedies, Palnatoke, and Axel and Walborg. After his return to his native land he was in 1810 appointed professor of æsthetics, and attracted large audiences for a series of years by his animated and graphic style of lecturing. In a new collection of his poems he introduced several lyrics, which may be considered as the happiest efforts of his muse. His conflict with J. Baggesen often gave him great pain, but undoubtedly contributed much to a purer taste in art. On a second journey to Germany and Italy in 1817–18 he enlarged the circle of his vision. Of this evident traces appear in his Travels, published in 1819. His poetical zenith was reached in the masterly epic Nordens Guder, the dramatic tales Fiskeren, the northern romances Helgen, and a series of dramatic pieces published under the general name of Tragedies. In his latter years he gave his talents a new direction, but did not thereby increase his fame. He died in 1850. Among his collected works, published in German in twenty-one vols. (Breslau, 1839), is an interesting autobiography.

OHM, the unit of resistance to the passage of electricity adopted by the British Association Committee. The resistances of all coils employed in electrical instruments, and of all wires and cables conveying electricity, are now usually stated in Ohms. Manufacturers of electrical apparatus furnish resistance boxes which enable any resistance to be measured in terms of this unit. A piece of pure copper wire 485 metres long and 1 millimetre in diameter at 0° C. has a resistance of about one Ohm. A 'megohm' is a resistance equal to 1,000,000 Ohms. This unit is employed in measuring the resistance of the gutta-percha or other insulating material of submarine cables, &c. Thus the insulation resistance of a nautical mile of Hooker's cable, as measured by the writer, was 25,000 megohms at 75° Fahr.

A microhm is a resistance equal to one-millionth of an Ohm. The resistance of one cubic centimetre of annealed copper, between two opposite faces, is 1·616 microhms. See Resistance, Ohm's Law, Units.

OHM'S LAW, an important law in electricity, first deduced by Professor Ohm from theory, and proved by his own experimental researches, and those of Daniell and many others, and whose complete establishment still engages the attention of students of natural philosophy. The electro-motive force of a galvanic cell (see Galvanic Battery) is that which causes a current to flow through the cell, and any external connector of the two electrodes. When, on joining any two points in space by a metallic wire, a current of electricity flows through the wire, the two points are said to be at different 'potentials' (which see), that from which the positive current flows having a higher or greater potential than the other. In this case the electro-motive force which produced the current is proportional to the difference of potentials between the two points. The current-producing power of a galvanic cell diminishes as it continues to act, through the metals becoming impure or getting coated with gases, or through the liquid becoming impure or weak. For simplicity we shall suppose, in illustrating Ohm's law, that the electro-motive force of a given element remains constant, and that different elements of the same kind have equal electro-motive forces. Practically this is nearly true for Daniell's cells.

The strength of the current flowing in a wire (or, as is more usual, 'the current') may be measured by means of a galvanometer. The difference of potentials between any two points, and hence the electro-motive force of any given element, may be measured by means of an electrometer. Ohm's law states that the currents flowing in two circuits which oppose equal resistances to the passage of electricity are

proportional to the electro-motive forces in the circuits; and again, the currents produced in two circuits by equal electro-motive forces are inversely proportional to the resistances of the circuits. The original law is concisely stated as follows:—

$$C = \frac{E}{R};$$

where C is the current, E the electro-motive force, and R the whole resistance of the circuit.

The current flowing between any two points of a wire is equal to the difference of potentials between the points divided by the resistance of the wire between the points. Thus if we consider points A, B, C, D, &c., in a wire in which a current is flowing, as the current is the same everywhere (it being supposed that there is no generator of electricity between the points), the differences of potential between A and B, A and C, A and D, &c., are proportional respectively to the resistances from A to B, A to C, A to D, &c. We here discover the principle of Wheatstone's Bridge, an arrangement of conductors much employed by electricians. If ACD is a connection between the points A and D, AC being one conductor and CD another, and if A and D are at different potentials (say that they are connected with the opposite poles of a galvanic cell), then no matter how A and D may otherwise be connected, the difference of potentials between A and D is to the difference of potentials between A and C, as the resistance of ACD is to the resistance of AC. Again, if AFD is another connector formed by two conductors AF and FD, the difference of potential between A and D is to the difference of potential between A and F as the resistance AFD is to the resistance AF. Hence, if C and F are at the same potential, the resistance in AC is to the resistance in CD as the resistance in AF is to the resistance in FD. Now, our test that C and F are at the same potential is that when they are connected by a wire no current passes through the wire. Hence one use of the arrangement may be as follows:—Let FD be a wire whose resistance is to be measured. Let AC, CD, and AF be wires whose resistances are known, and such that AF may be changed at pleasure to any other known resistance-coil. Connect A and D with the poles of a battery. Connect C and F through a delicate galvanometer. Vary the resistance AF until no current passes through the galvanometer. Then the proportion just mentioned will enable FD to be calculated. Thus if AC and CD are two equal resistances, no matter what, and if we can insert any of the coils of a resistance box between A and F; when no current passes through the galvanometer, the resistance FD is equal to the resistance AF. Kirchoff's law is a development of Ohm's, and relates to circuits in which there are here and there a number of electro-motive forces.

One practical application of Ohm's law is to the arrangement of cells in a battery. It must be remembered that when the zinc of one cell is joined to the copper of another, a compound cell is formed which has twice the electro-motive force of one of the cells alone, and whose internal resistance is twice the resistance of one cell. Thus if n cells are joined 'in series,' that is to say, the zinc of the first cell to the copper of the second, the zinc of the second to the copper of the third, and so on, and if the copper of the first cell is connected by means of an external conductor (such as a few feet or many miles of telegraph wire) with the zinc of the last cell, then the electro-motive force of the battery is nE, where E is the electro-motive force of one cell, and the whole resistance of the circuit is $nr + R$, where r is the internal resistance of one cell and R the resistance of the external conductor. Thus Ohm's law gives

$$\text{Current} = \frac{n\,E}{nr + R}.$$

Now if R, the external resistance, is very small, the current is nearly equal to $\frac{nE}{nr}$ or $\frac{E}{r}$, and hence is not very different from that which would be sent by one cell alone through the same external conductor. But if R is so large that nr in comparison is insignificant, the current is nearly $\frac{nE}{R}$, which is n times the current sent by a single cell through the same conductor. Hence, when the external resistance is great, that of a telegraph wire for instance, the cells of a battery ought to be arranged in this manner, which is called 'arrangement in series' (or by some practical men 'arrangement for intensity'). But cells may also be 'arranged as one element' (or 'arranged for quantity,' as said by practical men) by joining all the zincs together, and joining all the coppers together. Let the resistance of the external conductor connecting the electrode of all the zincs with the electrode of all the coppers be R. Now by this arrangement the battery has merely the electro-motive force (E) of one cell, but the total amount of the internal resistance is only $\frac{r}{n}$, where r is the internal resistance of one cell; and hence by Ohm's law

$$\text{Current} = \frac{E}{\frac{r}{n} + R} \quad \text{or} \quad \frac{n\,E}{r + n\,R}.$$

Now unless the external resistance R is small, nR is great in comparison with r, and therefore the current is nearly

$$\frac{n\,E}{n\,R}, \text{ or only } \frac{E}{R}.$$

If, however, nR may be neglected in comparison with r, the current is $\frac{nE}{r}$, or n times the current produced by one cell. We see, then, that when the external resistance is large the current is greatest when the cells are arranged in series, and when the external resistance is very small the current is greatest when the cells are arranged as one element.

If we have six cells we may cause every two to form one element, whose electro-motive force is therefore E, and whose internal resistance is $\frac{r}{2}$. We may now join these three elements in series so that the whole electro-motive force of the battery is 3E, and its internal resistance $\frac{3r}{2}$. We might have formed an element out of every three, and joined the two elements in series. We see that 12, 24, or 36 cells may be arranged in a great many different ways to form a battery. It may be shown from Ohm's law, that the greatest current is produced when the cells are so arranged that the internal resistance of the battery is equal to the external resistance. For example, given 27 cells, each with an internal resistance of 1·2 Ohms, and an electro-motive force of 1·5 Volts; it is required to arrange them as a battery to send a current through an external resistance of 3·6 Ohms. Let every three form an element; join the 9 elements in series. Here the electro-motive force of each element is 1·5, and of the nine is 13·5. The resistance of an element is $\frac{1{\cdot}2}{3}$ or 0·4, and of the nine is 3·6. As this resistance is equal to the external resistance, it may be proved that the arrangement is the best possible. The current here is

$$\frac{13{\cdot}5}{3{\cdot}6 + 3{\cdot}6}, \text{ or } 1{\cdot}875 \text{ Farads per second.}$$

OIL-BIRD, a name which has been applied to the guacharo of South America. See GUACHARO.

OIL-CAKE, a cake made of the residuum of linseed, rape, poppy, mustard, cotton, and other seeds, after they have been crushed to express the oil. It is used for feeding cattle, and also for manure. Linseed-cake is most freely used in England, and the home manufacture is preferred to foreign cake. This is supposed to be owing to the greater heat used in extracting the oil in foreign mills. The flesh-forming constituents in linseed-cake are about the same as in pease or beans, and they are superior to most vegetable foods for fat. Rape-cake is disliked by cattle, but is tolerated by sheep. It is often used in dust as a manure. Cotton oil-cake is much used as a manure in the United States.

OILEUS, one of the Argonauts. See AJAX.

OIL-GAS. It had long been known that wax, oil, tallow, &c., when passed through ignited tubes, are resolved into combustible gases, which burn with a rich light. Messrs. Taylor and Martineau were the first to avail themselves of this fact in the construction of apparatus for generating oil-gas on a large scale as a substitute for candles, lamps, and coal-gas. The advantages of oil-gas when compared with coal-gas were claimed by these gentlemen to be the following:—The material from which it is produced containing no sulphur or other matter by which the gas is contaminated, there are no objections to its use on account of the suffocating smell in close rooms. It does no injury to furniture, books, plate, pictures, paint, &c. All the costly and offensive operations of purifying the gas by lime, &c., are avoided, nor does the metal of which the conveyance pipes are made receive the slightest injury from oil-gas. The economy of light from oil-gas is thus stated:—

Argand burner, oil gas, ...	¾d. per hour.
Argand lamps, spermaceti oil, ...	3d. „
Mould candles, ...	3¼d. „
Wax candles, ...	14d. „

The oil-gas has a material advantage over coal-gas from its peculiar richness in olefiant gas, which renders so small a volume necessary that 1 cubic foot of oil-gas will be found to go as far as 4 of coal-gas. This circumstance is of great importance, as it reduces in the same proportion the size of the gasometers which are necessary to contain it. This is not only a great saving of expense, but is a material convenience where room is limited. The iron retorts employed, after a slight using, cease to afford the gas, from an alteration produced on the iron by the action of oil at a high temperature, and require the introduction of fragments of brick mingled with the oil, which produce a great increase of the decomposing power. A general idea of the process may be formed from the following account:—A quantity of oil is placed in an air-tight vessel in such a manner that it may flow into retorts which are kept at a moderate red-heat, and in such proportions as may regulate the production of gas to a convenient rate, and provision is made that this rate may be easily governed at the will of the operator. The oil in its passage through the retorts is principally decomposed with the production of ethylene, marsh-gas, hydrogen, carbonic oxide, benzene, &c., a gas being thus produced which has the great advantages of being pure from sulphureous contamination, and of supporting a very brilliant flame with a very small expenditure. As a further precaution to purify the gas from oil which may be suspended in it in the state of vapour, it is conveyed into a wash-vessel, where, by bubbling through water, it is further cooled and rendered fit for use. Oil-gas, though possessing some advantages above mentioned, cannot be economically used on a large scale, and no public works now exist for making it.

OIL OF VITRIOL, the common name of strong sulphuric acid (which see).

OIL-PAINTING. See PAINTING.

OIL-PALM (*Elæis Guineensis*), an African tree abounding on the west coast of that continent. The fruit forms a large head, which is compared to a huge pine-apple, and consists of a great number of drupes of a bright orange colour, having a thin outer covering or epicarp, through which the yellow oily pulp or sarcocarp is visible, and within this is the stone or endocarp, forming about a fourth of the whole bulk of the drupe. Palm-oil is of a deep orange colour, but becomes lighter on exposure to the air. When fresh it has a sweet violet odour. It is extensively used in its native countries as butter. It is used in this country for various manufacturing purposes. As a means of procuring artificial light the demand for it has declined since the introduction of paraffin. One species of the genus *Elæis*, the black-seeded oil-palm, is shown in Pl. CLIV.–CLV. fig. 6.

OILS. By the term 'oil' we mean a neutral body formed within the living animal or vegetable organism which is liquid at ordinary temperatures, has a more or less viscid consistence, is nearly insoluble in water, but dissolves in alcohol, in ether, and takes fire when heated in air, burning with a more or less luminous flame. The oils are usually divided into the *fat* or *fixed oils*, and the *volatile* or *essential oils*.

A. *Fat or fixed oils.*—These oils are divided into the *drying* and the *non-drying* oils. The former class includes all oils which thicken when exposed to the air through the absorption of oxygen, and are converted thereby into varnish. As examples of this class we may name linseed, nut, poppy, and hempseed oil. The non-drying oils when exposed to the air also undergo a change resulting in the formation of acrid disagreeable smelling acid substances: this decomposition, which is only partial, seems to be brought about by the presence of cellular matter derived from the plant or animal which has yielded the oil, this substance acting as a ferment on the fatty matter, such acids as butyric, caproic, valerianic, &c., being thereby produced. The fixed oils are for the most part glycerides, that is, ethers of the triatomic alcohol glycerine, and are resolved by saponification into glycerine and such fatty acids as stearic, palmitic, and oleic. (See GLYCERINE.) The fixed vegetable oils are generally prepared by subjecting the seeds of the plant to pressure; the animal oils are, for the most part, the fluid parts of the fat of the animal. These oils are often much adulterated, the cheaper oils, such as poppy, sesame, &c., being mixed with the more expensive, as olive, &c.

B. *Essential or volatile oils.*—This name is applied to those volatile fluids usually obtained from aromatic plants by subjecting them to distillation with water. The oil is volatilized with the aqueous vapour, and is easily condensed; a small portion of it is retained in solution by the water, but the greater part separates, and is obtained pure, inasmuch as the specific gravity of the oil is generally less than that of water. In some instances, as, for example, in the rind of the orange and lemon, the oil exists in distinct vesicles, and may be obtained by expression. The taste of these oils is acrid and burning, and their odour very pungent, resembling the taste and smell of the vegetables affording them. They are generally fluid, and remain so even at a low temperature; but some congeal at a very moderate degree of cold, and others are naturally concrete. They are volatile, but boil at a temperature considerably above that of boiling water, some of them undergoing partial decomposition. They are

very soluble in strong alcohol, but on adding water largely are precipitated. They are soluble in ether in like manner, but do not form soaps with the alkalies, by which they are distinguished from the fixed oils. They are readily inflamed by strong nitric acid, especially with the addition of some sulphuric acid. Exposed to the action of the air they undergo an alteration in consequence of the absorption of oxygen, thicken, and gradually change into a solid matter, resembling the true resins. When digested with sulphur they unite with it, forming what have been called *balsams of sulphur*.

In general, the volatile oils are used in the practice of medicine, or as perfumes. Those applied to the latter use, as the essence of rose, of jasmine, violet, &c., are possessed of a more feeble odour, and, being obtained from the flowers of their respective plants, require much care in their preparation. This is done by spreading upon white wool, impregnated with olive-oil, the petals of the flowers, and leaving them for some time covered over with a woollen cloth, upon which flowers are also scattered. The flowers are renewed from time to time, until the olive-oil employed appears to be saturated with the oil of the flowers, which is then separated by digesting the wool in alcohol. Another method consists in first preparing an odourless grease from suet, by repeated washing with water, removal of impurities by salt, alum, rose-water, gum benzoin, successively added, and desiccation by melting the grease and allowing it to cool in deep pans. This grease is then spread upon a glass plate inclosed in a wooden frame. Upon the grease the flowers are strewn, a similar frame is inverted on the other, and a pile of frames is constructed according to the amount of available blossoms. From time to time the old blossoms are removed and new ones added, and this is repeated until the grease is fully charged with the oil. The grease is then melted in a water bath, by which impurities are got rid of, and the grease can then be employed as a source of the oil. Sometimes, instead of this process, the flowers are added to melted grease, the operation being repeated by filtering off the exhausted flowers and then adding new. The minute details of these processes vary in particular cases, but the general principle is the same in all.

The essential or volatile oils chemically considered do not form a natural class, for under them are included bodies of quite different constitution, and very frequently they are mixtures of different bodies. Thus oil of wintergreen is an ether, oil of cloves a phenol, oil of cinnamon an aldehyde, and so on. When they are mixtures they usually contain a hydrocarbon and an oxygen compound, which are sometimes separable by fractional distillation (which see). At other times they may be separated by taking advantage of some striking property of the class to which one or other of the constituents may belong.

The essential oils have been arranged in four classes: 1. The hydrocarbons. 2. The oxygenated oils. 3. The sulphur oils. 4. The artificial oils or volatile oils, prepared by destructive distillation, fermentation, and other processes.

The most important of the hydrocarbons are the oils of turpentine, citron, orange, copaiba, bergamotte, and oil of roses. To this class also belongs petroleum. Of the oxygenated essences the most important are the oils of thyme, rue, mint, anise, cumin, wintergreen, carroway, cinnamon, cascarilla, cajeput, lavender, valerian; camphor and its modification cumarin. Oil of mustard and of garlic contain sulphur. Of the fourth class, oil of almonds, got by fermentation, is the best known. Some of these bodies have been already described under their respective heads, or under the plant which yields them.

OISE (Latin, *Isara*), a river in France, which rises on the frontiers near Selogne, in the province of Hainaut in Belgium, in the forest of Thierache, among the Ardennes, flows south-west across the departments of Aisne-et-Oise, and in the department of Seine-et-Oise joins the Seine on its right bank about 6 miles below Pontoise; total course, about 180 miles, of which 100, beginning below Chauny, are navigable; affluents on the left, the Ton, Serre, Lette, and Aisne; and on the right, the Noirieu, Brêche, and Thérain.

OISE, a northern department in France, bounded on the north by the department of Somme, west by Seine-Inférieure and Eure, south by Seine-et-Oise and Seine-et-Marne, and east by Aisne; area, 2261 square miles. The surface is slightly undulating. A considerable part of the soil is a strong clay, well adapted for wheat; where the mixture of sand is considerable the other cereals, as barley, oats, and rye, are considered the most profitable crops. The higher plateaux, where the surface is usually a good deal broken, are devoted to pastures, which rear great numbers of excellent cattle. Several districts, particularly one in the neighbourhood of Compiègne, remain covered with wood, which occupies nearly one-seventh of the whole surface. The quantity of grain produced greatly exceeds the home consumption. The vine is not much cultivated, and the wine produced is indifferent. The ordinary orchard fruits succeed much better, and are extensively grown, and much cider is made. Building-stone and pavement are extensively quarried. Manufactures have made considerable progress; they consist chiefly of all kinds of woollen tissues, also linens, pottery, leather, paper, cordage, bricks and tiles, beet-root sugar, &c. These various articles furnish the materials of an important trade, which includes, in addition, corn, fruit, cider, cattle, poultry, hewn stone, turf, and lignite. For administrative purposes Oise is divided into four arrondissements—Beauvais, Clermont, Compiègne, and Senlis; subdivided into thirty-five cantons and 701 communes. Beauvais is the chief town. Pop. in 1881, 404,555.

OKA, two rivers, the one in European and the other in Asiatic Russia. The former, rising in the government of Orel, flows north till near the town of Kaluga, then east past that town, then E.N.E. across Riazan and the east of Vladimir, and after a course of about 600 miles, navigable from Orel, joins the Volga at Nijnei-Novgorod. The latter, rising in the mountains between China and the government of Irkutsk, flows N.N.E. for 400 miles, and joins the left bank of the Angara at Bratsk.

OKEN, Lorenz, more properly Ockenfuss, which he afterwards himself changed to Oken, an eminent philosopher and practical naturalist, born in 1779 at Bohlsbach in the Swabian district of Ortenau, studied at Würzburg and Göttingen, and after acting for some time as a private teacher, was in 1807 invited to become extraordinary professor of medicine at Jena. Here he lectured with great acceptance on natural philosophy, natural history, zoology, with comparative anatomy, vegetable, animal, and human physiology. In 1812 he became ordinary professor of natural science. In 1816 he began to edit the Isis, a general scientific journal, but more especially devoted to natural history. As there was then greater freedom of the press in Weimar than elsewhere, all kinds of complaints from other quarters were sent to Oken, who, provided they possessed any general interest, published them in the Isis. This made him very obnoxious, and at last the government of Weimar gave him the alternative to resign either his chair or the Isis. He chose the former, and the Isis, now prohibited in Weimar, continued to be

printed at Rudolstadt till it became defunct in 1848. At the same time he became implicated in the affair of the Wartburg festival, but was found free from blame. After being deprived of his chair, he continued to reside in Jena, engaged as a private lecturer and in scientific pursuits till 1828, when he obtained the appointment of professor of natural history in the newly-erected University of Munich. On refusing to accept an exchange to another Bavarian university he gave in his resignation, and in 1832 accepted an invitation to the newly-erected University of Zürich, where he died in 1851. His great aim was to exhibit a general and harmonious system of nature embracing all its kingdoms and elements. Its philosophical foundations are laid in his Lehrbuch der Naturphilosophie (Jena, second edition, 1839), and it is completely unfolded in his Lehrbuch der Naturgeschichte (three vols. Leipzig, 1813–27). As his system is peculiar, and differs from all others previously existing, German terms often failed him, and he created a nomenclature of his own, which frequently sounds very harsh, and being difficult to master has met with no acceptance. His natural philosophy was often misunderstood, and, moreover, gave occasion to the appearance of a host of shallow writers, who, arraying themselves in a mystical garb, spoke of the commonest phenomena in the darkest terms, and supplied the place of sound judgment by extravagant and arbitrary assumptions. These wild offshoots have greatly discredited Oken's natural philosophy with the English and French, who studied them as practical introductions to his views. In Germany, on the contrary, it is generally acknowledged that he has given a new and profitable direction to natural researches. Oken was also eminent as a practical anatomist and physiologist, and has written much on these subjects. His principal work is Allgemeine Naturgeschichte für alle Stände (thirteen vols. Stuttgart, 1833–41). A bust of Oken, executed by Drake of Berlin, was erected in the Eichplatz of Jena in 1853.

OKHOTSK, a town in Siberia, capital of the coast province, situated on a narrow tongue of land projecting into the sea between the Okhota and Kuchtiu, consists of clusters of indifferent log-houses. The harbour is shallow and unsafe, and has accordingly been given up for that of Aian further south. Pop. 1200.

OLAF THE FAT (*Olaf II.* and *St. Olaf*), one of the most celebrated of the Norwegian kings, great-great-grandson of Harald Haarfager, and son of Harald, chief of the district of Gränland, was born about 995, and early made himself famous and formidable by his piratical excursions to England and Normandy. After the death of Eric, the previous monarch, and the expulsion of his son, he caused himself to be proclaimed the only lawful king of the land. He began his reign by a thorough change in the nature of the court, introduced a special court of law called the Hirdskra, and restored the ancient boundaries of Norway and Sweden; but above all was a zealous supporter of Christianity, severely punishing those who persisted in adhering to heathenism. He may indeed be called the real converter of Norway. The severity which he employed for this purpose afterwards exposed him to a formidable retaliation at the hands of his own subjects. Having engaged in war with Canute the Great, king of England, he leagued with Jacob, king of Sweden, and was at first victorious, but afterwards was so completely defeated that he was obliged to take refuge in Sweden and Russia. In 1028 he was induced by a dream to return to Norway, where he found the people so alienated from him that he could only bring 3000 men into the field to oppose the forces of the mighty Canute. The armies met at Sticklestad in the vicinity of Drontheim in 1030, and Olaf lost both the battle and his life. His body was buried in the cathedral of Drontheim, and he has since 1164 been honoured as the patron saint of Norway. Many legends respecting him are current throughout the North, and his name has been given to an order founded by King Oscar in 1847.

OLAND, or OELAND, an island in Sweden, in the Baltic, separated from the mainland by Kalmar Sound, which, where narrowest, is not above 3 miles broad. It is long and narrow, stretching 85 miles from north to south, and not averaging above 8 miles from east to west; area, 595 square miles. It consists almost throughout of limestone strata, which in several spots form steep chalky cliffs parallel to the west shore, but the surface in general is low. It is well-wooded, and contains much land available both for cultivation and pasture. There are numerous small villages in it, the chief of which is Borgholm. Pop. 30,000.

OLBERS, HEINRICH WILHELM MATTHÆUS, an eminent astronomer, born at Arbergen in the Duchy of Bremen in 1758; attended the cathedral school of Bremen, then studied medicine in Göttingen, and returned to practice in Bremen, where he continued so employed till a short time before his death in 1840. Both as a man and a physician he was highly respected. In 1811 he shared with Jurine of Geneva the prize offered by Bonaparte for the best essay on croup. In early youth he had become strongly attached to astronomy, and the study of it afterwards became the ruling passion of his life. He directed his attention particularly to comets, and discovered a new method of ascertaining their course by means of three observations. He published an account of it at Weimar in 1797, and it is still generally in use. He also furnished the most complete lists of the comets whose course had been calculated; and in 1815 discovered a new one, which bears his name. Another discovery for which he is still better known is that of two planets, Pallas in 1802, and Vesta in 1807. Many of his most interesting papers, by which he enriched astronomy in all its branches, first appeared in Zach's Monatliche Correspondenz, Schumacher's Astronomische Nachrichten, and other periodicals.

OLDBURY, a town in England, in the county of Worcester, in the heart of a mining district, 5 miles W.N.W. of Birmingham, and having stations on the London, North-Western, and Great Western Railways. It is irregularly built, but has several spacious modern streets. It has manufactures of chemicals, iron and steel works, edge-tool and nail works, brick and tile works, limestone quarries, and extensive iron and coal mines. Pop. (1881), 18,821.

OLDCASTLE, SIR JOHN (*Lord Cobham*), was born in the fourteenth century, in the reign of Edward III., and obtained his peerage by marrying the daughter of Lord Cobham. He excited the resentment of the clergy by his zealous adherence to the doctrines of Wickliffe, whose works he collected and transcribed, distributing them among the people. In the reign of Henry IV. he was at the head of an English army in France during the Orleans and Burgundian factions, and he obliged the Duke of Orleans to raise the siege of Paris. Under Henry V. he was accused of heresy; but the king, with whom he was a favourite, delayed the prosecutions against him, and tried to reason with him, and to convince him of his alleged errors, but in vain; and he soon after left him to his fate. He was then cited before the Archbishop of Canterbury, and not being able to satisfy his accusers he was condemned as a heretic, and committed to the Tower, whence he escaped into Wales. A report was then zealously circulated by the clergy, and sent

to the king, that 20,000 Lollards were assembled at St. Giles's for his destruction, with Lord Cobham at their head. This accusation seems to have been fully credited by Henry, though there does not appear to have been really the slightest foundation for it, and a bill of attainder being passed against Lord Cobham, he was arrested and burned alive in St. Giles' Fields in December, 1417. He was a man of high spirit and warm temper, which his misfortunes could not subdue. His acquirements were extensive, and his thirst after knowledge first made him acquainted with the doctrines of Wickliffe. In conversation he was remarkable for the poignancy and readiness of his wit. He wrote Twelve Conclusions addressed to the Parliament of England, published in Bale's Brefe Chronycle concernyng the Examynacyon and Death of the blessed Martyr of Christ, Syr Johan Oldecastle, the Lorde Cobham, which was reprinted in 1729. The play of Sir John Oldcastle is one of the seven doubtful plays sometimes attributed to Shakspere.

OLD CATHOLICS, a section of the Roman Catholic Church, the formation of which resulted from the declaration of the infallibility of the pope by the vote of the 18th of July, 1870, in the œcumenical council which met at Rome at the close of 1869. (See COUNCIL.) The name was first assumed by a body of Roman Catholics at Munich, headed by Professors Döllinger and Friedrich, who, in the autumn of 1870, united in protesting against the new dogma, and who claimed to be faithful to the ancient traditional constitution of the church, while they were hostile to an innovation which they regarded as essentially altering its character. The chief centres of the Old Catholic movement are the universities of Germany; but the movement was also set agoing in Switzerland, where it has spread rapidly and widely. At the end of August a meeting of Old Catholics was held at Nürnberg, but nothing of importance was done at it; and for the first year the progress of the movement in Germany was slow. This was to a great extent due to the warnings of Döllinger against the erection of separate Old Catholic congregations, lest this should lead to the severance of the body from the rest of the church, with which they still desired to maintain their connection, in spite of the fact that many of the most prominent actors in the movement had been excommunicated. At the first Old Catholic congress, which was held at Munich from the 20th to the 24th of September, 1871, a more aggressive attitude was taken up. It was then determined to form separate congregations for the body, and to enter into a close connection with the Church of Utrecht (the so-called Dutch Jansenists), a body which had arisen within the Church of Rome at the beginning of the eighteenth century. The doctrinal belief which united them was also stated in a more pronounced manner than it had ever been before. Although the movement arose simply from the opposition to the dogma of infallibility, that opposition necessarily implied a rejection of the decrees of a general council, and it was now distinctly denied that the decrees of a general council had any validity unless they were confirmed by their harmony with the convictions of the Catholic people and with the state of theological science. After this the Old Catholic movement spread more rapidly. Congregations belonging to the body were formed at several places; and as it was necessary to procure consecration and confirmation for the priests of the body, and the German bishops of course refused to perform this function, Loos, the archbishop of Utrecht, the head of the body with which they had allied themselves, visited Germany in July, 1872, for the purpose. At their second congress, held at Gürzenich from the 20th to the 24th September, 1872, the Old Catholics resolved to elect a bishop of their own, according to the ancient usage of the church, by the clergy and people combined, which was actually done, Dr. Joseph Reinkens being elected on the 1st of June, 1873, the first bishop. The third congress was held in Sept. 1873 at Constance, and was attended by a number of distinguished representatives of foreign churches. The principal resolutions of this congress were the adoption of a synodal constitution for the body, and the appointment of sub-committees to treat with representatives of the Anglican, Greek, and Russian churches with a view to discover the points of agreement between them and the Old Catholics. Yearly congresses have since been held, and in 1878 it was resolved that celibacy was not incumbent on priests, a resolution in which the Old Catholics of Germany had been preceded by those of Switzerland.

The Old Catholic movement in Germany was greatly aided from the first by the position taken up by the imperial government, and still more by the governments of some of the separate states. The imperial government declared that the question which divided the Old and New Catholics was a purely internal one, which it had no right to decide, and accordingly gave equal recognition to both parties, and defended the inferior clergy of the Old Catholics against the New Catholic bishops with respect to all that the state had any concern with, namely, the right of Old Catholics to retain what offices they held, and the emoluments of these offices, in spite of any sentence of excommunication passed on them by their bishops. The Prussian government went still further than this. The persistent persecution of the Old Catholics by the New Catholic bishops convinced them of the necessity there was for the relations between church and state being regulated anew; and the result was that the minister of public worship, Dr. Falk, introduced four bills for the purpose into the Prussian Landtag in the session of 1872–73, all of which were passed during the same session. The first of these provided for the training and appointment of the clergy in Prussia; the second stated the conditions under which any priest or other ecclesiastical functionary might dissolve his connection with the church; the third fixed the limits of ecclesiastical discipline; and the fourth provided for the erection of a royal court for ecclesiastical affairs.

The Old Catholic movement has had a similar course in Switzerland. There also the bishops unanimously supported the new dogma, and excommunicated the priests who rejected it; but there also the state intervened, and zealously protected the latter. At present the Old Catholics of Switzerland number about 75,000, those of Germany 70,000.

In other countries the movement has made very little way. Abbé Michaud, who began it in Paris in Feb. 1872, met with little success. In Austria it failed through the opposition of the government, and in Italy it was equally unsuccessful. An Old Catholic committee met at Rome May 7, 1872, but separated without effecting anything of importance.

OLDENBURG, a grand-duchy in the north of Germany, bounded north by the North Sea or German Ocean, east by Hanover and Bremen, south and west by Hanover; greatest length, north to south, 84 miles; greatest breadth, 47 miles; area, 2076 square miles. This forms the Duchy of Oldenburg, or Oldenburg proper; but in addition to it the duchy possesses two separate patches of territory, distinct both from it and from each other, namely, one in Holstein, forming the principality of Lübeck, with an area of 209 square miles, and Birkenfeld, in the south of Rhenish Prussia, with an area of 194 square miles, thus making the whole area 2479 square miles.

Oldenburg proper is flat throughout, excepting in the southern extremity, where some low hills appear. The principal rivers are the Weser, the Hunte, its affluent; the Jahde, Hasse, Soeste, Vehne, and Leda. There are no lakes of great extent. Storms often blow from the sea; and frequent fogs produce a cold, damp air, which occasionally robs even summer of its proper warmth. The surface in respect to soil is divided into marshy and sandy land. The former has in many instances been recovered from the sea, and still is only protected from it by means of dikes similar to those erected in Holland and Holstein. It consists generally of a heavy alluvium, capable when properly laid dry of yielding heavy crops of wheat, beans, and hay. The sandy land is very light, and of little fertility, and not unfrequently is left in a state of nature, forming extensive tracts of barren heath. A considerable part of the sandy districts were once covered with wood. Much of it has disappeared, but there are still several extensive forests. Agriculture, employed in raising not only corn but rape, hemp, and flax, and including the rearing of horses and cattle, is the principal source of subsistence. Since the admission of Oldenburg into the Zollverein in 1853 manufactures and trade have made considerable progress. The principal branches of manufacture are cotton-spinning, iron-founding, making of tobacco and cigars, cork-cutting, and joinery. The shipping is extensive. In 1881 the number of vessels entered at the ports of Oldenburg was 2109, of 110,726 tons burden; and the number cleared 2148, of 123,678 tons. The inhabitants are generally a patient and industrious race, but habits of intoxication are very prevalent. The Principality of Lübeck has chiefly a flat or undulating surface. The northern section has several lakes, of which lakes Keller, Uklei, Eutin are situated in the midst of beautiful scenery. The only other important lake is the Hemmelsdorf Lake. It and Lake Keller are the two largest. Birkenfeld is a mountainous district. In the upper parts the climate is cold and rude, but in the small sheltered valleys mild and healthy. The agricultural products are dye-plants, flax, hemp. Grain is not grown in sufficient quantity to meet the consumption. Wood is abundant. The minerals include iron, copper, coal, and the commoner kinds of gems, especially agates, which last furnish the material for the chief industry of the principality, that of stone cutting and polishing. So celebrated has it become in this respect that many stones are sent to it from other parts of Europe (cairngorms, for example, from Scotland) in order to be polished and worked up there. The centre of this industry in Birkenfeld is the small town of Oberstein. Among the other industries are tanning and weaving. Mining (for iron) is carried on to a considerable extent, but the ironstone is mostly sent to other places to be smelted and wrought.

The constitution of the Grand-duchy of Oldenburg dates from February 18, 1849, but was revised by a decree of November 22, 1852. The legislative body is a Landtag or diet of one chamber, having one member for every 10,000 inhabitants. The franchise belongs to all citizens paying taxes and who have never been condemned for felony. The mode of election is indirect, every 300 electors choosing one delegate, and every twenty delegates one deputy to the chamber. The grand-duchy sends one member to the Bundesrath and three members to the Reichstag of the German Empire. In the budget for 1883 the revenue of the grand-duchy was estimated for that year at £309,799 and the expenditure at £323,726. The public debt at the end of 1883 amounted to £1,912,533. Elementary education is compulsory. The contingent of troops supplied by Oldenburg to the imperial army consists of a regiment of infantry, a regiment of cavalry, and two batteries of artillery. The Oldenburg contingent is included in the royal Prussian army.

In the earliest times Oldenburg was inhabited by the Chauci, and at a later period belonged to the Duchy of Saxony. In 1180 the Counts of Oldenburg and Delmenhorst took advantage of the overthrow of Henry the Lion to make themselves immediately subject to the empire. In 1448 Christian, the son of Count Dietrich, was elected King of Denmark, and founded the Oldenburg dynasty in Denmark and Holstein. A younger brother, Gerhard, continued the line in Oldenburg, but the last of his male descendants dying in 1667 the country fell to Denmark, and was governed by viceroys. In 1773 the King of Denmark ceded the counties of Oldenburg and Delmenhorst, to the Emperor of Russia, also a descendant of the house of Oldenburg, who in return surrendered all his possessions in Holstein and Schleswig, and conferred the two counties on his cousin, the Bishop of Lübeck. In 1774 Oldenburg, with Delmenhorst, was made a duchy. Considerable additions, including the bishopric of Lübeck as a hereditary principality, were made to the Oldenburg territories in 1803, most of which were incorporated with the French Empire in 1810, but restored, with further additions, and with the rank of a grand-duchy, by the Congress of Vienna in 1815. The congress merely decreed that a district containing 20,000 inhabitants belonging to the former French department of Saar should be assigned to Oldenburg without fixing the boundaries of the district more definitely; and it was by a treaty concluded with Prussia in 1817 at Frankfort-on-the-Main in accordance with this decree that Birkenfeld, which had been occupied by Prussia since 1814, was ceded by that power to Oldenburg. Pop. in 1880, Duchy of Oldenburg, 263,648; Principality of Lübeck, 35,145; Principality of Birkenfeld, 36,685; total of grand-duchy, 337,478.

OLDENBURG, a town in Germany, capital of the grand-duchy of the same name, 24 miles W.N.W. of Bremen, on the Hunte, which, here receiving the Haaren, forms a harbour. It has a castle, with palace, several churches, college, library of 15,000 volumes, picture-gallery, gymnasium, barracks, normal and military schools, several hospitals; manufactures of refined sugar, soap, and musical instruments; numerous breweries and distilleries, besides iron-founding, soap-boiling, ship-building, and tanning establishments, and a trade in wood, wool, and cattle. Pop. 18,416.

OLDHAM, a town, England, Lancashire, on a height near the junction of the Irk and Medlock, and on the London and North-Western, and Lancashire and Yorkshire Railways, 6 miles north-east of Manchester. In 1760 it contained only about sixty dwellings, mostly thatched huts; but its progress has been so rapid, in consequence of the valuable coal-mines in its vicinity and the facilities thus afforded for cotton factories, that it is now a leading manufacturing town, with over 22,500 inhabited houses. It is very irregularly built, and cannot boast much of its public buildings. The more important are its churches and chapels, a handsome and commodious town-hall, the lyceum and science and art school, a free library and museum (recently built), the blue-coat school, and the infirmary. The spinning and weaving of cotton are the staple industries of the town, and employ within it and in its vicinity about 250 mills. Hats, once a very important branch of industry, are still made extensively; and there are several large machine-shops, iron and brass foundries, tanneries, roperies, silk-factories, bleach-works, &c. Oldham, first made a borough by the Reform Act of 1832, elects

two members. Pop. mun. bor. in 1871, 82,629; parl. bor., 113,100; in 1881, 111,343 and 152,513 respectively.

OLD MAN OF THE MOUNTAINS. See ALOADIN.

OLD STYLE. See CALENDAR.

OLDYS, WILLIAM, a celebrated bibliographer, born according to some in 1687, according to others in 1696; died in London, April 16, 1761. His father left him a small property, which, however, he soon dissipated. He was reduced to very poor circumstances, when he was appointed librarian to the Earl of Oxford. He remained ten years more or less in this nobleman's service, and in 1755 was appointed by the Duke of Norfolk Norroy king-at-arms. His dissolute habits remained with him through life, and he died poor. The works by which he is best known are The British Librarian, exhibiting a compendious review or abstract of our most scarce, useful, and valuable books in all sciences as well in manuscript as in print (London, 1738), and A Life of Sir Walter Raleigh, prefixed to his History of the World (1738). Among his other productions are several biographies in the General Dictionary (1734–41), contributions to Mrs. Cooper's Muses' Library (1737). He left at his death several valuable MSS., one of which bears the title of London Libraries; with Anecdotes of Collectors of Books, Remarks on Booksellers and on the First Publishers of Catalogues.

OLEACEÆ, the olive family, a natural order of dicotyledonous, gamopetalous, hypogynous plants, closely allied to the Jasmineæ, with which some authors have united it. The typical genus is *Olea* (olive). The flowers are hermaphrodite, or sometimes diœcious; the calyx is gamosepalous and persistent; the corolla is 4-cleft, sometimes of four petals, petals sometimes wanting; the stamens are two in number, the anthers attached at the middle; the ovary is two-celled, each cell containing two ovules, the seeds often solitary by abortion. The members of this order are trees or shrubs with opposite leaves either simple or compound. The inflorescence is in racemes or panicles. They inhabit principally the temperate regions of the northern hemisphere as far as the 65th degree of latitude, but are also found in Australia. This order includes some genera which are of great importance economically, such as the olive and the ash, several species of which yield manna. The order is divided into two sections—the *Oleæ*, with a drupaceous or berried fruit; and the *Fraxineæ*, with a dry, winged, indehiscent fruit.

OLEANDER (*Nerium oleander*, Linn.), a beautiful shrub belonging to the natural order Apocynaceæ, well known by its terminal clusters of flowers of various shades, from white to rose-coloured. It grows spontaneously in Southern Europe and on all the coasts of the Mediterranean. Like many other plants of this order it contains a poisonous juice, which is sufficiently powerful to render it necessary to take precautions for having the plant placed beyond the reach of children. A medicine was formerly extracted from it, which was used as a remedy against certain cutaneous diseases, but it has now been almost entirely given up.

OLEFIANT GAS. In the year 1796 four Dutch chemists, named Deiman, Paets van Troostwyk, Bondt, and Lauwerenburgh, discovered a new gas from which, under certain conditions, an oily liquid could be produced; on this account they gave to the new gas the name olefiant, or oil-producer. This name is yet retained, and is used as synonymous with many others, such as *heavy carburetted hydrogen*, *ethylene*, and *ethene*. Olefiant gas is produced by the destructive distillation of many organic bodies, such as coal, resin, caoutchouc, &c.; it is therefore present in coal-gas, indeed it is to this body that coal-gas owes a great part of its illuminating power. This compound may be obtained from inorganic materials by passing the vapour of carbon disulphide mixed with sulphuretted hydrogen over heated copper, when an action ensues which may be thus formulated—

$$2CS_2 + 2H_2S + 6Cu = C_2H_4 + 6CuS.$$

It is more easily obtained, however, by the removal from alcohol of the elements of water, by the agency of strong sulphuric acid. If a mixture of one volume of alcohol be heated in a flask with four volumes of sulphuric acid (a little sand being added to prevent the undue frothing of the mixture), olefiant gas, along with small quantities of sulphurous acid, is evolved. By passing the evolved gas through milk of lime the sulphurous acid is absorbed; and if a second bottle containing strong sulphuric acid be placed after that containing the lime, any traces of alcohol which may have been carried over, or of ether, which is often produced in the reaction, will be absorbed: the pure gas may be collected over water.

$$\underset{\text{Alcohol.}}{C_2H_6O} - H_2O = \underset{\text{Olefiant Gas.}}{C_2H_4}.$$

This compound, olefiant gas, is colourless; it has a faint ethereal odour, is irrespirable, and may be liquefied by exposure to strong pressure. On the approach of a lighted body it takes fire, and burns with a very luminous flame, accompanied by the deposition of considerable quantities of carbon. If this gas be mixed with three times its volume of oxygen, and the mixture ignited, a violent explosion occurs, and we find that the olefiant gas has been entirely burned to carbon dioxide and water, thus, $C_2H_4 + O_6 = 2CO_2 + 2H_2O$. If a mixture of two volumes of chlorine with one volume of olefiant gas be made, and immediately brought into contact with a lighted taper, combustion of the mixture ensues, and a very copious deposit of carbon is formed on the sides of the vessel. In this experiment the whole of the hydrogen of the olefiant gas has been removed by the chlorine in the form of hydrochloric acid, while the whole of the carbon has been set free, $C_2H_4 + Cl_4 = C_2 + 4HCl$. If the amount of chlorine be equal to that of the olefiant gas, and the mixture be allowed to remain at rest, especially in the sunshine, an entirely different action ensues; the two substances combine together directly, and there is produced that liquid the formation of which has given to this gas its most common name,

$$C_2H_4 + Cl_2 = C_2H_4Cl_2.$$

Ethylene dichloride, or *Dutch liquid*, is a colourless, neutral, oily liquid, having a fragrant ethereal odour and a sweetish taste; its specific gravity is 1·25; it boils at 82°·5 C., is nearly insoluble in water, and when ignited burns with a greenish, smoky flame, giving off vapours of hydrochloric acid. The bromide and iodide corresponding to this chloride are well-known bodies. This substance (C_2H_4) forms a series of salts in which it plays the part of a divalent radicle, taking the place of two atoms of hydrogen; a series of hydrates are also obtainable, which may be regarded as a double water molecule, in which H_2 is replaced by C_2H_4, thus—

$$\left.\begin{matrix}H_2\\H_2\end{matrix}\right\}O_2 \qquad \left.\begin{matrix}C_2H_4\\H_2\end{matrix}\right\}O_2.$$

These hydrates are alcohols; they are known by the general name of *glycols*. A great number of other derivatives of this substance are known.

OLEIC ACID. This name is applied to the liquid acid obtained by the saponification of non-drying oils and solid fats. If olive-oil be saponified with caustic potash (see SOAP), the ensuing soap decomposed by

tartaric acid, and the fatty acids thus separated, washed, and then heated in a water-bath with oxide of lead, oleate and stearate of lead are formed; by shaking up with ether the oleate only is dissolved, and from this solution pure oleic acid may be prepared by decomposing the lead salt with hydrochloric acid, decanting the ethereal liquid, which contains free oleic acid, and evaporating it. Oleic acid at temperatures above 14° C. forms a colourless oil; at low temperatures it solidifies in the form of a hard, white, crystalline mass. When the liquid acid is exposed to the air it rapidly absorbs oxygen, with the formation of rancid-smelling, oxygenated compounds. The formula $C_{18}H_{33}O.HO$ is given to this acid; it is monobasic, forming a series of oleates represented by the general formula $C_{18}H_{33}O.MO$, where M equals a metal such as potassium or sodium.

OLERON, an island in France, about 1 mile from the coast of the department of Charente-Inférieure, to which department it belongs, and separated from the Isle of Ré on the north by the Pertuis d'Antioche; greatest length, 18 miles; greatest breadth, 7 miles; area, 96 square miles; population, 18,013. With the exception of the west side, which, lying exposed, has a wild and bleak aspect, the surface is generally fertile, producing good corn and wine. Good salt is obtained from the salt bays on the coast. It has two towns, Château and St. Pierre, the former fortified. This island belonged first to the counts of Anjou and the dukes of Aquitaine, and was united to the crown by Charles V. It was ceded to the English by the Treaty of Brétigny, but reconquered by Charles VII. It was fortified by Louis XIV. Under the Convention it was called Isle of Liberty (*Ile de la Liberté*).

OLERON LAWS (*Jugements*, or *Rôles d'Oleron*), a code of maritime laws which long regulated the navigation connected with La Rochelle, Bordeaux, and the coasts of Normandy and Brittany. It is said to have been compiled at the end of the eleventh or the beginning of the twelfth century; but it is probable that the provisions contained in it had been long in force before they were committed to writing, and that even the oldest part of the written code belongs to a later date. The code was published for the first time in the Collection des lois maritimes of M. Pardessus. See COMMERCIAL LAW.

OLFACTORY NERVES. See NERVE, NOSE.

OLGA, ST., was the wife of the Grand-duke Igor of Kiev, who became acquainted with her when on a hunting party in Pskov. Though she was only a simple peasant belonging to a neighbouring village she possessed uncommon talents and an excellent character. After her husband had, about 945, lost his life in battle, she managed the government for her minor son Svätoslav till 955, and then went to Constantinople, where she was baptized by the Patriarch Theophilactes. At her baptism she took the name of Helena, but after her death in 969 she was canonized by the Greek Church under her original name. Her festival is kept on the 11th of July (O.S.) She is held in high estimation by the Russians as being the first grand-duchess who embraced the Christian religion, but her saintship is not recognized by the Romish Church.

OLIBANUM. See FRANKINCENSE.

OLIFANT'S (or ELEPHANT) RIVER, a river in Cape Colony, which rises about the south-eastern boundary of Clanwilliam division, flows north-west through that division, and falls into the Atlantic. It receives the Great and Little Doom on its right bank. It is navigable for boats for 30 miles up, but like almost all the other rivers of the colony is encumbered at its mouth by a bar over which no ordinary sailing vessel can float.

OLIGARCHY (from Gr. *oligos*, few, and *archē*, government), that form of government in which the supreme power is placed in the hands of a small exclusive class.

OLINDA, a seaport town in Brazil, in the province of Pernambuco, on the Atlantic, 3 miles north of Recife, with which it unites in forming what is commonly called the city of Pernambuco. Though not regularly built the houses are generally good. Many of them, however, are untenanted, and the whole place has a dilapidated and decaying appearance. The principal buildings are a cathedral, townhouse, episcopal palace, ecclesiastical seminary, an hospital, and several monasteries. It has also a botanical garden. The trade is chiefly in cotton, sugar, and rum. Pop. 8000.

OLIVA, a village in Prussia, in the province of East Prussia, not far from Dantzig. In a Cistercian abbey in this village a peace was concluded, May 3, 1660, which terminated the war between Sweden, Poland, the emperor, and Brandenburg. John Casimir, king of Poland, renounced his claims on Sweden, Sweden renounced Courland, both powers acknowledged the independence of Prussia. In consequence of this Sweden restored Trondhjem and Bornholm to Denmark by the Peace of Copenhagen, May 27, 1660, and concluded the Peace of Kardis with Russia (1661). The Peace of Oliva is important on account of its having laid the foundation of the subsequent political relations of the north of Europe. Pop. of the village (1880), 3922.

OLIVAREZ, GASPAR DE GUZMAN, COUNT OF, DUKE OF SANLUCAR DE BANAMEDA, was born in 1587 at Rome (where his father was ambassador to Sixtus V.), of a distinguished Spanish family. He was educated at the University of Salamanca, and was afterwards appointed gentleman of the bed-chamber to the Prince of Asturias, and managed to insinuate himself into the favour of his royal master to such an extent that soon after the latter succeeded to the throne as Philip IV. Olivarez was appointed prime minister, in place of his uncle, the Duke of Uceda, through whom he had at first been introduced to the notice of the Prince of Asturias. For twenty-two years (1621–43) his power was almost unlimited. The beginning of his administration was marked by measures of public utility; but his sole object soon became the extortion of money from the people to supply the expenses of the war with Holland, France, and other foreign powers. His severity occasioned revolts in Catalonia and Andalusia. The Portuguese, disgusted by his government, threw off the Spanish yoke, and acknowledged the Duke of Braganza king in 1640. Olivarez communicated the intelligence of this event to the king as a subject of congratulation, since it justified the confiscation of the enormous possessions of the duke in Spain. The foreign wars, however, were so fatal to Spain, whose armies were defeated by the French, and whose fleets were destroyed by the Dutch, that the king was finally compelled by the universal public discontent to dismiss his minister. Olivarez was thus forced to retire from the stage at the moment when, delivered from his formidable rival Richelieu, he might have perhaps succeeded in retrieving affairs. He would probably have been recalled had he not written an apology for his measures, by which he offended several powerful individuals, and in consequence the king found it expedient to confine him at Toro, where he died in 1645.

OLIVE (*Olea Europæa*), a tree belonging to the natural order Oleaceæ. This interesting tree, in the more northern regions of the globe, does not usually attain a greater height than 18 or 20 feet, with a trunk 1 or 2 feet in diameter; but in warmer climates

it reaches the height of 40 or 50 feet. It grows slowly, and is very long-lived. Notwithstanding the specific name, it is not a native of Europe; but it has been so long cultivated on the borders of the Mediterranean that the period of its introduction from Asia is utterly unknown. In its general appearance the olive-tree bears some resemblance to the willow, but it possesses very little beauty. As in the other species of the genus the leaves are evergreen and entire; they are opposite, lanceolate, from 1 to 2½ inches long, and their inferior surface is covered with a scaly powder, which gives them a silvery appearance. The flowers are small, white, and are disposed in branching, axillary racemes; the corolla is monopetalous, surrounding two stamens and a single style. The fruit is an ovoid and more or less elongated drupe, with a thin, smooth, and usually blackish skin, containing a greenish soft pulp adherent to a rough, oblong, and very hard stone; it is almost the only example of a fruit with an oily pulp. Like other plants which have been long cultivated, a great number of varieties have arisen from the influence of soil, exposure, and especially of different modes of cultivation. The olive was celebrated in the mythology of the ancients; olive wreaths were used to crown the brows of victors. By the Greeks and Romans it was revered, and was considered the emblem of peace and humility. It furnished that oil which, for a long time, was the only kind known, and which was employed by most nations in religious ceremonies. The athletes anointed their bodies with olive-oil when preparing for gymnastic exercises; and it was very generally used in the same manner on coming out of the bath. The oil is still the principal product of the olive, and is consumed in immense quantities for culinary purposes in many countries. It is inodorous, and the taste is very mild; but if taken in large quantities it is purgative. Great quantities are used in the manufacture of soap; and in the south of Europe it is burned in lamps. The fruit has too much asperity to be eaten in its natural state, except in one or two varieties; but after being prepared in various manners, it furnishes an important article of nourishment to the inhabitants of olive countries, and, moreover, makes its appearance on the tables of the rich in almost every part of the globe. The oil, together with the pickled fruit, is the source of a very extensive commerce between the Mediterranean and the north of Europe: in many districts the whole population is entirely dependent on this branch of business. From the Levant, and particularly from some islands in the Archipelago, immense quantities of pickled olives are exported to the market of Constantinople. The oil that is obtained by simple expression, without the use of boiling water, is the best and purest; and that made in some parts of France is now the most highly esteemed.

A temperate and equable climate is essential to the constitution of the olive. Too much heat is as hurtful to it as severe cold. In Europe it has never been successfully cultivated north of latitude 45°; but it would seem that it is less the intensity than the suddenness of cold after mild weather that is injurious; for the trees have been known to endure very severe cold, and again to be destroyed by an ordinary frost coming on after the sap has begun to ascend. The olive grows in every kind of soil, provided that it is not marshy. It is planted at intervals of 20 or 30 feet, as it requires plenty of air and light. It is easily multiplied by cuttings and pieces of the root, and so tenacious of life that a piece of the bark covered with earth has produced shoots and roots at the end of forty-two days. It is best raised from seed, or from wild plants taken from the woods, which are grafted with the desired variety. The proverb that 'no man who has planted an olive has ever tasted the fruit,' though by no means literally true, has arisen from the extreme slowness of its growth. The fruit is ripe about the end of November or beginning of December; but the product is abundant only every other year. The wood is yellowish, fine-grained, hard, and susceptible of a brilliant polish. Although highly esteemed, it is too valuable a tree to be much employed in the arts.

Various other species of olive are known—all trees or large shrubs, with opposite, or rarely alternate leaves, and small flowers, disposed in racemes or panicles. Among them is the *O. fragrans*, a native of China, Japan, and Cochin China: the flowers are highly odoriferous, and are used by the Chinese to mix with and perfume their tea, and also, together with the leaves, for adulterating it. The only species inhabiting the United States is the *O. Americana*, called in some districts *devil-wood*, according to Michaux, on account of the excessive hardness and extremely difficult splitting of the wood. Notwithstanding this quality it is neglected in the arts. The leaves are broad, lanceolate, coriaceous, entire, and shining. The fruit is a globose drupe, about twice as large as a pea, and purple when ripe. It is a large shrub, or small tree, sometimes, however, reaching the height of 30 or 35 feet, with a trunk of 10 or 12 inches in diameter. It is a maritime species, and grows in company with the live-oak and cabbage-palm. It is found thinly disseminated along the sea-coast from lat. 37° to Florida, and along the shores of the Gulf of Mexico to Louisiana.

OLIVENZA, a town in Spain, Estremadura, in the province of Badajoz, on the left bank of the Guadiana, 15 miles south of the town of Badajoz. It is surrounded by a wall in the form of a nine-sided polygon, and entered by three gates; is tolerably well built, and has among its edifices a fine church, with a magnificent portico of white marble. The manufactures are cloth and earthenware, and there are several oil and flour mills. It was conquered from the Portuguese in 1658, but restored by the Peace of Lisbon in 1668; again taken by the Spaniards in 1801, since which date it has been retained by the latter, although ordered to give it up by the Congress of Vienna in 1815. Pop. 7759.

OLIVES, Mount of, a hill on the east side of Jerusalem, from which it is separated by the valley of Jehoshaphat and the brook Kedron. It is noted as a favourite resort of our Saviour and his disciples, and is still, as formerly, covered with olive-trees. When viewed from a position below the eastern wall of the city it is seen to consist of four eminences lying from north to south. These are called Galilee, or Viri Galilæi, Mount of Ascension, Prophets, and Mount of Offence. The northernmost of these derives the name by which it is known among Christians from the fact that it is supposed to be the hill on which two angels addressed the apostles after our Lord's ascension, 'Ye men of Galilee.' It is called by the Arabs Karem es Seyad, that is, Vineyard of the Sportsman. The next in order, proceeding southwards, gets its name of Mount of Ascension from the erroneous supposition, originated it seems by the Empress Helena, that this was the scene of our Lord's ascension, a supposition contradicted by the narrative of Luke (chap. xxiv. verses 50, 51), where it is said that Christ 'led them out as far as to Bethany.' This was the most important of all the eminences. At its foot lay the garden of Gethsemane. The next eminence southwards is rather a portion of the previous one than a separate height, and is remarkable for containing a celebrated catacomb, known as the 'Tombs of the Prophets' (perhaps in allusion to the words of Christ in Matt. xxiii. 29).

The southernmost eminence is called the Mount of Offence, because it is supposed to be the 'Mount of Corruption' on which Solomon erected the high places for strange gods (1 Kings xi. 7; 2 Kings xxiii. 13). In Old Testament times it was probably from this mount that the appearance of the new moon was watched for and proclaimed, and it was on the eminence called the Mount of Ascension that the solemn sacrifice of a red heifer was made. The exact spot fixed for this rite was due east of the sanctuary, and at such an elevation that the officiating priest while performing his duties could see the façade of the sanctuary through the eastern gate of the temple. (See Num. xix.)

OLIVETANS, an order of Benedictine monks and nuns founded about the beginning of the fourteenth century by Tolomei of Siena, and named from a hill adjoining that city where the parent house was erected.

OLIVINE, called also *chrysolite*, is a mineral occurring in lava, basalt, and certain meteorites. Analysis proves it to be a silicate of iron and magnesium, agreeing with the general formula $(Mg.Fe)_2SiO_4$. The colour of this mineral is generally olive-green, inclining to brown; it is transparent, has a conchoidal fracture, and uncoloured streak.

OLLA PODRIDA, a favourite dish of the Spaniards, consisting of several kinds of meat, vegetables, &c., cut up and stewed together. It is equivalent to the French *pot pourri*.—The same name is also given to a vase of odoriferous flowers and herbs. It is often used metaphorically to denote a medley.

OLMÜTZ (Moravian, *Holomauc*), a city in Austria, in Moravia, 38 miles north-east of Brünn, on the March, which forms almost a complete circle around it. It is extensively and strongly fortified, and rises gradually on all sides towards its centre. It has a cathedral, a fine Gothic building, erected by King Wenzel III., who was murdered here in 1306, and is buried within the church. Its manufactures are chiefly of linen and woollen cloth, ironmongery, and articles in iron-wire. Its trade is unimportant. Olmütz was formerly the capital of Moravia, and is still the see of an archbishop, and the seat of several courts of law and public offices. It formerly possessed a university, but this is now abolished except the theological faculty. It is one of the strongest fortresses in the Austrian dominions, but was taken by the Swedes, under Torstenson in 1642, in the Thirty Years' war. Frederick the Great besieged it for seven weeks in 1758 without success. Lafayette was confined here from 1792 to 1794. Pop. 20,176.

OLONETZ, a government in Russia, bounded north and east by Archangel; south-east by Vologda; south by Novgorod; south-west by St. Petersburg and Lake Ladoga; and west by Finland; area, exclusive of the larger lakes, 50,493 square miles. The surface of this government is generally flat; but in the north-west some hills of moderate elevation occur, while part of the south is traversed by the dorsal ridge which forms the water-shed between the basins of the Baltic and the Volga. The drainage of the government is shared, in unequal proportions, between the Baltic, White Sea, and Volga; the first, through the medium of Lake Onega, receives the far largest share; and the second, chiefly by the Onega, receives the next largest; the share received by the Volga is confined to a small portion of the south. The most marked natural feature of the government is the large number of its lakes, streams, and morasses. The number of lakes—one of them, Onega, nearly 5000 square miles in superficial extent—has been calculated to amount to 1500; and that of the rivers, great and small, to 800. The climate is rigorous in the extreme. The winter is long, and so severe that quicksilver occasionally freezes; and the summer heat, though of short duration, is very great. Timber constitutes almost the whole wealth of the government; the lakes and rivers are in general well supplied with fish; porphyry and marble are extensively quarried between Lakes Ladoga and Onega; iron-ores are extensively worked; copper is also partially worked; and hemp and flax thrive in many of the swampy districts where corn would fail, and may be regarded as, after timber, the most valuable vegetable products of the government. Gold and silver, marble, porphyry, serpentine, and alabaster are also found. There is likewise clay of excellent quality. The chief means of support of the inhabitants are forestry, hunting, and fishing. The principal manufacture is that of leather, which forms one of the chief articles of trade. Education is very backward. Olonetz is divided into seven districts. One military governor presides over both Olonetz and Archangel. The capital of the government is Petrozavodsk. Pop. 317,110.

OLONETZ, a town in Russia, in the government of the same name, a few miles from the eastern shore of Lake Ladoga, 125 miles north-east of St. Petersburg. It has a considerable trade in fox-skins. The first building-dock in the Russian Empire was established here by Peter the Great, and some vessels are still built at it. Pop. 1341.

OLORON-SAINTE-MARIE, a town in France, in the department of Basses-Pyrénées, 14 miles south-west of Pau, on a hill near the Gave, here crossed by a lofty bridge connecting Oloron with Sainte Marie. Its manufactures are cutlery, chocolate, stocking-frames, blankets, woollen bonnets and checked handkerchiefs, much worn by the peasantry of Gascony and Aragon; and the trade is chiefly in Spanish wool, Bayonne hams, and other salt provisions, cattle, and horses. The timber cut on the Pyrenees has its chief depôt at Oloron. Pop. (1881), 9117.

OLOT, a town in Spain, Catalonia, in the province of Gerona, 55 miles north of Barcelona, in a basin nearly inclosed by a circle of volcanic hills. The most remarkable objects at Olot are its *bufadors*, or openings at the base of a hill; they send forth subterranean gusts of wind, which blow with the greatest violence in hot weather, sometimes making the thermometer fall from 94° to 53°. There are cotton and woollen manufactories, tanneries, &c. Olot was almost destroyed by an earthquake in 1427. Pop. 9984.

OLTEN, a town in Switzerland, in the canton of Soleure, on the Aar, 20 miles E.N.E. of the town of Soleure. It is the centre of the Swiss railway system, and the seat of the chief railway manufactories of the country. There are also manufactures of cotton, leather, paper, and hosiery. Pop. 2998.

OLVERA, a town in Spain, Andalusia, in the province of Cadiz, on a lofty height, 63 miles north-east of Cadiz. It consists of poor houses, but has a handsome parish church adorned with marble sculptures, a large court-house and prison, and several potteries and flour and oil mills. On a neighbouring hill are the ruins of an old Moorish castle. Pop. 6492.

OLYMPIA, the scene of the famous Olympic games; a beautiful valley or plain lying in the middle portion of the ancient district of Elis, in the western part of the Peloponnesus (Morea). Here were collected thousands of statues of the gods and of victors in the games, treasure-houses full of votive offerings, temples, altars, tombs, and in a word the most precious treasures of Grecian art. The elder Pliny states that in his time the statues were as many as 3000 in number. Here also were preserved important public and private documents, treaties, and inscriptions of all kinds. The Altis (an old Elean

form of *alsos*, a grove), in which were situated the Olympiēum or great temple of Zeus, containing the colossal statue of the god by Phidias, the Heræum or temple of Hera, the Metroum or temple of the mother of the gods, the treasuries of the different states which had sent votive offerings to the Olympic Zeus; the Prytanēum, in which the Olympic victors dined after the contests were finished; the Bouleuterion, in which all the regulations regarding the games were made, and other buildings and sacred objects, formed a quadrangle surrounded with walls, and having a length of about 1800 feet and a breadth of 1500; and the Exedra, a splendid building containing the reservoir of an aqueduct, erected by the Athenian orator and statesman Herodes Atticus, and furnished by him with statues of the families of the emperors Antoninus Pius and Marcus Aurelius, and by the Eleans out of gratitude to the builder with statues of the family of Atticus himself. On the north it was bordered by rocky but gently swelling hills, the most southern of which was called Mount Cronius, or the Hill of Kronos. On the south it extended almost to the river Alpheius, and on the west it stretched to the Cladeus, a tributary of the former. Outside the walls, but in the immediate neighbourhood of the Altis, were the hippodrome, or race-course for chariots and for single horses; the stadium or foot-race course; a theatre, and a gymnasium. After being buried for ages under the soil washed down from the higher grounds, and conveyed by the inundations of the two streams between which it lies, the plain of Olympia has again been brought to view by a series of excavations begun in 1875 by the German government at the instigation of Ernst Curtius, and continued till the spring of 1881. Nearly all the buildings above mentioned have been discovered, but unfortunately all in a much injured condition. Thousands of fragments of sculpture, bronzes, coins, terra cottas, as well as numerous coins and inscriptions, are also among the discoveries. The originals are all to remain in the possession of Greece, but Germany bargained for the right to take the first casts from them, and a museum of Olympian casts and duplicates has been formed at Berlin.

OLYMPIAD, the period of four years between each celebration of the Olympic games, by which the Greeks computed time. The historian Timæus is said to have been the first to adopt this mode of reckoning time, and later Greek historians almost all followed his example. In reckoning by this era the year in which Corœbus gained the victory in the foot-race, corresponding to 776 B.C. of the Christian era, was taken as the first year of the first Olympiad. This mode of reckoning ceased when the games were abolished in 394 A.D., the second year of the 293d Olympiad. The interval between two Olympiads was four of our years, or a Greek *pentaëteris* of forty-eight moons and two intercalary months. To reduce from the Olympic to the Christian era, multiply the next number below the given Olympiad by four, and add the number of the year in the given Olympiad; if the sum is 776 or less, subtract it from 777, and the remainder is the year B.C.; if it is greater than 776, subtract that number from it, and the remainder is the year A.D. Thus the fourth year of the eighty-seventh Olympiad (usually written Ol. 87·4) corresponds to 429 B.C., because $86 \times 4 + 4 = 348$, and $777 - 348 = 429$. Again, the second year of the 198th Olympiad (Ol. 198·2) corresponds to 14 A.D., because $197 \times 4 + 2 = 790$, and $790 - 776 = 14$. It must be noted, however, that as the Olympic year began in midsummer, the beginning of an Olympic year corresponds with the middle of the year of the Christian era to which it is reduced by this process. The Olympiads were first named after the conquerors in the games; but in after-times, they were otherwise distinguished: for instance, in Athens, to the name of the conqueror was added the name of the ruling archon; at Lacedæmon, the name of the ephori; at Argos, the name of the priestess of Hera; at Delphi, the name of the Pythia, &c. The records, thus made and kept under the superintendence of the magistrates, were preserved among the archives of each state, where every one might consult them. In later times private persons took copies. Unfortunately, none have remained to us.

OLYMPIAS, the wife of Philip II., king of Macedonia, and the mother of Alexander the Great. Her haughtiness, and more probably her infidelity, led Philip to repudiate her, and to marry Cleopatra, the niece of King Attalus. The murder of Philip, which soon followed this disgrace (B.C. 336), some have attributed to the intrigues of Olympias. Alexander the Great allowed her no influence, but in 319, after the death of Antipater the successor of Alexander, she was enabled to assume a share in the government of the country; but being guilty of various barbarities she was attacked by Cassander, son of Antipater, who besieged her in Pydna, where she had retired with the remains of her family. She was obliged to surrender, after an obstinate siege, and was put to death (316 B.C.).

OLYMPIC GAMES, the most solemn of the four great national festivals of the ancient Greeks. They were celebrated on the plain of Olympia, and were sacred to the Olympian Zeus, who had a temple and statue there. (See OLYMPIA.) The festival was a quadrennial one; the period elapsing between two celebrations was called an Olympiad (which see). Their origin reaches back into a remote antiquity, prior to the commencement of the historical era in Greece, and by the Greeks themselves was attributed in various traditions to a divine source. The first historical fact regarding them is that after having fallen into neglect (probably more than once) they were revived and reorganized by Iphitus, king of Elis, in conjunction, it is said, with Lycurgus of Sparta, at some period in the ninth century before Christ, which cannot be precisely fixed; some say 884 B.C., others 828 B.C. On the occasion of this re-institution by Iphitus one important regulation was made, and was accepted by the Greek states. This was the *ekecheiria* or sacred armistice, which put a stop to all warfare during the month in which the games were celebrated, and which thus had the effect not only of giving increased sacredness to the festival, but also not unfrequently of mitigating the ferocity of internecine war among the Greek states. This armistice was proclaimed by heralds, first in Elis and afterwards in the other Greek states. The territory of Elis was regarded as peculiarly sacred during the period of celebration. The season of the year at which the games were held was about midsummer. In later times, when the contests were numerous, they lasted five days, and the fourth day of the festival was the day on which the first full moon after midsummer fell, and therefore, according to the Greek mode of dividing the year, the 14th day of the month. The games thus lasted from the 11th to the 15th inclusive. The management of the games was entirely in the hands of the Eleans, who appointed by lot from among themselves the Hellanodicæ or judges. The number of the judges varied at different times, but ultimately was fixed at eight. Their decision was not final, but might be revised by the Elean senate. Under the judges were a set of police called Alytæ, with an Alytarches at their head, who kept order during the celebration of the games. The competitors in the games seem in the earliest times to have been all Peloponnesians, but gradually Greeks

from more distant states came to take part in them. None but Greeks of pure descent were allowed at any time to take part in them, until the conquest of Greece by the Romans, when they also were admitted to the contests. If, however, a man could boast of pure Hellenic blood, it did not matter to what city he belonged, or whether he was rich or poor, he had in any case an equal right to be recognized as a competitor, provided he complied with the regulations of the judges. Barbarians were permitted to be spectators of the games, but slaves were not allowed even this privilege. Women also were entirely excluded, and were not even allowed to cross the Alpheus while the games were going on. For the first thirteen Olympiads there was only one contest, a foot-race. In course of time the number of contests increased to twenty-four, including shorter and longer foot-races, wrestling, boxing, chariot-racing, horse-racing, foot-racing in heavy armour, chariot-racing with mules, and games for boys corresponding to most of those in which men engaged. The prize awarded to the victor was merely a garland of wild olive, but the honour of gaining such a prize was so highly esteemed that a victor in the Olympic games was regarded as bringing glory not only to himself but to his family, and even the city or state to which he belonged. The victor received his crown standing on a table made of ivory and gold (originally a tripod covered with bronze). His own name, and that of his father, and his native state, were proclaimed by a herald to the assembled multitudes. The celebration was concluded by religious ceremonies and processions, and by banquets in honour of the victors. On returning to his native city the victor was honoured with a triumphal procession, and heard his praises celebrated in lyric verse, which was sometimes the production of the greatest poets of the time (such as Pindar). In addition to this special privileges were usually conferred on them for life. A place of honour was allowed them in all public assemblies, statues were erected to them, and so forth. At Athens they were maintained for the rest of their life in the Prytaneum, at the public cost. Besides their primary object the meetings of Greeks at the Olympic (and other) games derived additional importance from some of the secondary objects which they served, for example, the negotiation of commercial transactions and the publication of literary works, by reading them before the large multitudes there assembled. Herodotus is said to have resorted to this method of publication, and Hippias, Prodicus of Ceos, Anaximenes, and others are known to have done so. This, however, was not a regular part of the games any more than the business transactions.

OLYMPUS. Several mountains had, among the ancients, the name of Olympus. The most celebrated of them was situated in Thessaly, at the eastern extremity of the range called the Cambunian Mountains. It is now generally called by the Greeks Elymbos or Olymbos. The Turks call it Semavat-Evi, the abode of the celestials. It rises to the height of 9700 feet or more above the level of the sea, and was the highest mountain in ancient Greece. The earliest Greeks looked upon it as the highest of all mountains, and as the central point of the earth's surface. It was the mountain of heaven or of the gods, and the gods of Homer dwelt on its summit. Over its top there was supposed to be an opening into the metallic dome of heaven, which rested upon mountain-pillars at the circumference of the earth. In after-times, when the ideas of men respecting the universe and the gods were enlarged, the supreme beings were said to reside in the exterior sphere of the heavens, revolving round the space which embraced the planets; and this new abode of the gods above the firmament of heaven received the name of Olympus. Besides the opening at the top of the mountain there were two gates in this imaginary dome which met the earth's circumference, one in the east the other in the west, through which the sun and the night with their train ascended from the ocean into the heavens and returned again. The gods themselves were called from their dwelling-place, whether upon earth or in heaven, *Olympian* gods, and, as such, formed a body of which Zeus was the head. The twelve great gods composed the council of elders in Olympus, and the others collectively formed the general assembly. They did not dwell together in a single palace, but separate in several, built upon the different tops of the many-peaked Olympus. At the highest summit stood the palace of Zeus, where all assemblies and feasts were held in a large hall. From thence he could look down upon the earth, fill the heavens with clouds, and hurl his thunderbolts.

The only other important elevation bearing this name was the Mysian Olympus, a range of lofty mountains in the north-west of Asia Minor, now called Kheshish Dagh, Ala Dagh, Ishik Dagh, and Kush Dagh. It extends from west to east through the north-east of Mysia and the south-west of Bithynia.

OM, a Sanskrit word to which the Hindu religion attaches peculiar sanctity. It is pronounced at the beginning and end of every lesson in the Veda, and is also the introductory word of the Puranas. In the Vedas it is said to comprehend all the gods. In the Katha-Upanishad it is said, 'Whoever knows this syllable obtains whatever he wishes.' The origin of the word is variously accounted for. The oldest and seemingly the correct interpretation of it is that given in the Rigveda, where it is stated that it is the term of assent used by the gods, while *tathâ* is that used by men; in which case the one is probably an old contracted form of the Sanskrit word *evam*, 'thus.' But even by ancient Sanskrit grammarians another etymology is given connecting it with a root *av*, meaning 'protect, save,' from which its original form was got by the addition of the suffix *man*. Om, the contracted form of the word *avman*, thus obtained, would accordingly signify 'protection or salvation.' Another supposition is that the word is formed by the initials of the three personifications of the triad of elements, *agni*, fire, *varuna*, water, and *marut*, wind or air. The initials of these three words yield *aum* (*u* being taken for *v*), a word which is phonetically equivalent in Sanskrit to *om*. The laws of Manu explain the mysterious power and sanctity ascribed to the word *om* by saying that it was formed by Brahma himself, who extracted the letters *a*, *u*, *m*, from the Vedas, one letter from each. Later speculators assigned to each of these three letters a symbolical meaning. Thus they were taken to symbolize the nature of the soul in its three inferior conditions —in its waking and dreaming conditions, and in its state of dreamless sleep; while the whole word symbolized the soul in its fourth or highest condition.

OMAGH (Irish *oigh magh*, 'seat of the chiefs'), the county town of Tyrone, Ireland, situated near the centre of the county on the Strule. It is mentioned as a fortress at the end of the fifteenth century, when it was taken by the English. It was included in the 'Plantation' grants made by James I. of England to English and Scotch settlers. Among the public buildings are several churches and chapels, the court-house, lunatic asylum, workhouse, barracks, &c. The business is mainly confined to the fairs, weekly markets, and the retail trade of the surrounding populous neighbourhood. Pop. 4126.

OMAHA, a city in the United States, capital of the state of Nebraska, situated on the western bank of the Missouri, in Douglas county, 118 miles west by south of Des Moines in Iowa. A bridge crosses the Missouri and connects the city with the Chicago and North-western, the Union Pacific and other railway systems. Among the principal buildings are the United States court-house and post-office, the high school, Creighton College, about 30 churches, military barracks, &c. Omaha is the centre of an extensive agricultural and mining district. It possesses large silver smelting works, steam-engine and boiler works, construction and repair shops of the Union Pacific Railway, soap works, breweries and distilleries, pork-packing establishments, linseed-oil works, &c. Pop. in 1870, 16,083; in 1880, 30,518.

OMAN, a sultanate in the east of Arabia. The name is usually applied to the maritime district comprised between Ras Mesandum and Ras-el-Hadd, the extreme eastern shoulder of the peninsula. Arabs give to Oman, however, a much wider range, extending it from Aboo Debi, a village on the Persian Gulf, about lat. 24° 30′ N., and lon. 54° 40′ E., to the neighbourhood of Dhofar on the Indian Ocean, about lon. 54° E. Although mainly a maritime kingdom, Oman proper is the richest part of the Arabian peninsula both in agricultural products and in mineral treasures. The working of gold and silver filigree, with which daggers, belts, cups, and pipes are often adorned in Oman, supports great numbers in the larger towns. The inhabitants are tolerant, but very superstitious and immoral. The form of government is a monarchy limited by a powerful aristocracy with hereditary privileges, and the prescription of popular rights. Each town and village has its separate corporation; while towns and villages are in turn subject to ancestral chiefs. The area is 81,526 square miles; and the population is estimated at 1,598,000.

OMAR I., successor of Abu-bekr, and second caliph of the Mussulmans after Mohammed. Like Abu-bekr he was a father-in-law of the prophet. He was born about 582, and became a follower of Mohammed about 615. He succeeded Abu-bekr in 634. His caliphate is celebrated for the great extension of Mohammedanism which took place while it lasted. In 638 the conquest of Syria was completed by his general Abu-Ubeida, after a brave resistance on the part of the Byzantines. His general Amru was equally successful in Egypt in 638 to 640. When in 637 or 638 Jerusalem was compelled to surrender, Omar hastened thither himself in order to dictate the terms, which afterwards served as a model to the Mohammedans on all similar occasions. The chief articles were the following:—'The inhabitants shall retain their lives, their property, and their churches; but they shall build no new churches, nor place crosses upon those which they already have; they shall not ring the bells, but they are allowed to toll them. When a Mussulman travels through the city they shall offer him hospitality for three days. They shall convert no one from Mohammedanism, nor shall they prevent their relations from embracing it. They shall use neither the language, nor the dress, nor the name of Mohammedans. They shall neither bear arms nor sell wine; shall remain faithful to the caliph, and regularly pay their taxes.' Omar's generals likewise invaded Persia, defeated the army of Yezdegerd, and conquered the capital and kingdom. The Mussulmans pursued their conquests far into Africa, but Omar did not live long to enjoy his glory. On the 3d of Nov. 644 he was mortally wounded at Medina by a Persian slave. The nobles asked him to appoint a successor; but he refused, and especially rejected with earnestness the proposition of naming his son. 'It is enough,' said he, 'that one out of my family has been forced to bear this burden.' The caliphate thus became elective. (See CALIPH.) Mohammedanism has never had a more virtuous and zealous apostle; he observed strictly all the precepts of the Koran, and was celebrated for his justice and clemency. He founded the cities of Bassora (636) and Kufa (638), conquered 36,000 cities or castles, destroyed 4000 temples and churches, and built 1400 mosques. Omar is distinguished for having established the era of the Hejra. Mohammed said that if God had wished to give another prophet to the world, his choice would have fallen upon Omar. He made the pilgrimage to Mecca nine times.

OMAR PASHA. See OMER PASHA.

OMASUM, the third compartment of the stomach of ruminant mammals, otherwise known as the psalterium or 'manyplies' (which see).

OMBAY, or MALLUA, an island in the Indian Archipelago, about 18 miles north-west of Timor, from which the Ombay Passage, in the line of one of the best routes from Europe to China, separates it. It is about 1840 square miles in extent, 50 miles long, presents a bold coast and lofty interior, is inhabited by savage tribes, said to be fierce and treacherous, and carries on some trade with Timor in birds'-nests and provisions, exchanged for iron-work, Chinese-wares, and linen.

OMEGA (Greek, signifying 'great *o*'), the name for the Greek long *o*. It was the last letter in the Greek alphabet, as alpha was the first; and from the expression in Revelation (chap. i. 8), 'I am Alpha and Omega, the beginning and the ending, saith the Lord, which is, and which was, and which is to come, the Almighty,' the signs of alpha and omega (that is, A Ω) became with the Christians symbolical hieroglyphics. Inscriptions (for instance, on tombstones, public documents, &c.) very often began with these two letters, meaning, 'In the name of God.' The two Greek letters, as might be supposed, were believed to have great magical powers, and it was probably owing to usages that prevailed in the times of alchemy that German physicians were accustomed to begin their prescriptions with A Ω.

OMELET, or OMELETTE, a dish made by whipping the contents of broken eggs into a froth, to which is added some such ingredient as chopped savoury herbs, minced ham or bacon. The mixture is cooked by frying in a clean frying-pan, which is first smeared with lard or butter to prevent sticking. A sweet omelet is made by frying the whipped eggs without the addition of any other ingredient, and then laying on preserved fruits when the omelet is ready or nearly ready.

OMENS, certain accidental circumstances which were once thought to predict good or evil. They might consist of audible sounds of any kind, but especially articulate words, or some other impression made on the senses; any unusual appearance in the animal world or in nature; any sudden emotion or trifling accident, such as stumbling, the breaking of a shoe-tie, sneezing, &c. A sudden light diffused through the house, or appearing in any place, was a good omen, for it was thought to indicate the presence of a deity. On the other hand, it was a bad omen if any thing strange happened to the images of the gods. Ominous words were lucky or unlucky according to their signification and accidental relation. Such an omen was effectual only when it made an impression on the hearer. To avert an ill omen a stone was sometimes thrown at whatever portended evil, or the ominous animal was killed that the prediction of evil might be turned upon him. Words of ill omen were thrown back on the person who spoke them by the expression, 'On thine

own head.' There were also peculiar magic ceremonies to avert portended evil. A piece of thorny or barren wood was burned to ashes and thrown into a brook or into the sea upon the occurrence of a bad omen. It was the general custom for people, when evil omens occurred, to leave the occupation in which they were engaged, to be resumed at a more favourable opportunity.

OMER, St., a town in France, in the department of Pas-de-Calais, in a marshy district on the Aa, which is here navigable, and at the mouth of the canal of Neuf-Fosse, 23 miles south-east of Calais. It ranks as a fortress, being surrounded by ramparts and defended by several outworks; but its most important defences are its marshes, and the extent to which they can be laid under water. It has a fine cathedral, showing the transition from the round to the pointed style; the ancient church of the Jesuits, whose convent is now occupied by the college; the abbey church of St. Bertin, at one time the noblest Gothic monument of French Flanders, and though greatly dilapidated in 1794, only made the miserable ruin it now is by the barbarism of the town magistrates in 1831; manufactures of woollen cloth, woollen covers, thread, starch, oil, glue, earthen pipes, fishing-nets, salt, leather, paper, beer, and brandy; and an important trade in wool, corn, wine, oil, flax, coal, &c. A seminary here for the education of English and Irish Roman Catholics, founded by Philip II. of Spain in 1596, had at one time acquired considerable celebrity. The town came into the possession of the French by the Treaty of Nimeguen in 1678. Pop. (1881), 21,556.

OMER PASHA, a Turkish general, born at Plaski, in the Ogulin circle of the Austrian Military Frontier in 1806; died at Pera in 1871. He belonged to a Croatian family, and his original name was *Michael Lattas*. He served for a time in an Austrian frontier regiment, and was afterwards sub-inspector of roads and bridges. In 1833 he left this employment, it is not exactly known from what motive, and fled into Bosnia, where he soon after adopted the Mohammedan faith, and was appointed tutor to the children of the governor of Widdin. His fine caligraphy afterwards procured him the position of teacher of writing in a military school, and ultimately that of teacher of Prince Abdul-Medjid, afterwards sultan. Having obtained the rank of captain in the Turkish army, he was advanced by his pupil, when he came to the throne in 1839, to that of colonel, in which capacity he distinguished himself in the Syrian campaign of 1840. In 1842 he was appointed military governor of Lebanon, but was soon after recalled on account of his severity in dealing with the Christians of his government. During the next few years he was almost constantly engaged in quelling a series of rebellions that broke out in various parts of the Turkish dominions, the most alarming of which were that in the Danubian Principalities in 1848, those in Bosnia in 1850–51, and that in Montenegro in 1852–53. His expedition against Montenegro failed through the interference of Austria. In 1853, when the differences between Russia and Turkey relative to the Danubian Principalities threatened to lead to the outbreak of hostilities between the two countries, Omer Pasha was appointed commander of the Turkish army stationed on the right bank of the Danube, with which, in October of the same year, he crossed that river, and thus began the war. His operations were not of much importance; nevertheless he harassed the Russians a good deal by numerous skirmishes, by the success of which the spirit of his own troops was raised, and finally defeated them in a three days' engagement at Oltenitza (Nov. 2–4, 1853). After the arrival of the allied army in the Crimea, Omer Pasha was sent to act under Saint-Arnaud. He joined the allies before Sebastopol in January, 1855, but was soon after intrusted with the command of another army destined to act in Asia Minor. He began operations in October, but did not arrive in time to prevent the fall of Kars in December, and was accordingly obliged to retreat to the coast without effecting anything. After the war he lived for some time in retirement and disgrace, but in November, 1857, was appointed Governor-general of Irak Arabi, and took up his residence at Bagdad. Here again his energetic but arbitrary behaviour brought him into disgrace, and occasioned his banishment to Kutahia, from which he was not recalled till the spring of 1861, when he was appointed governor of Rumelia. In 1862 he quelled an insurrection of the Montenegrins, compelling the native prince to accept a disadvantageous peace (September 8). The only subsequent military operations which he conducted were those in connection with the suppression of the Cretan insurrection in 1867, in which he displayed his usual energy and severity.

OM MANI PADME HUM, a sacred formula, known as the 'formula of six syllables,' used in the Buddhist religion, and especially in Lamaism, a form of Buddhism. Among the Tibetans and the Mongols it is repeated on all occasions, important and unimportant, and is found written on all sorts of objects on which inscriptions can be made. It is the first thing which a child learns to repeat. When written in the form of a monogram its sacred character is exalted. The formula is explained to mean either, 'Oh, the jewel in the lotus: Amen;' or 'Salvation in the jewel-lotus: Amen,' referring to the deified saint Avalokites'wara or Padmapâni, the reputed author of the formula, who was believed to have been born from a lotus. In later times a mystical meaning was given to each of the six syllables composing the phrase.

OMMIADES. See Caliph.

OMNIBUS, a Latin word signifying 'for all,' and now applied in several languages to the well-known vehicle used in the large towns of all civilized countries to convey passengers at a cheap rate from one part of the town to another, or from the town to its suburbs, taking them up and letting them down wherever they desire. The first conveyances of the kind were those which came into use in Paris on the 18th of March, 1662, in consequence of an edict of Louis XIV. They were called *carrosses à cinq sous*, were each capable of containing eight persons, and travelled on certain routes at fixed times whether occupied or not. They were at first well patronized, but did not long continue in fashion, and accordingly went out of use. The omnibus system was reintroduced at Paris between 1823 and 1827. The first omnibuses were started in London by a Mr. Shillibeer on the 4th of July, 1829. They were introduced into New York in 1830, and into Amsterdam in 1839.

OMPHALĒ, daughter of the Lydian king Iardanus, and wife of Tmolus, after whose death she administered the government. Heracles was sold to her for a slave by Hermes (Mercury), and performed some remarkable exploits in her service. Omphalē rewarded him by submitting to his embraces, and bore him several children. Heracles was so enamoured of her that, to please her, he assumed the garments of a female, adorned his fingers with gold rings, had his hair curled, and spun among her female slaves, while she wore the lion's skin and wielded the club. Omphalē governed with great severity, and was no less licentious and extravagant than cruel.

OMSK, a town in Western Siberia, in the government of Tobolsk, on the right bank of the Irtish, at

the confluence of the Om, 280 miles south-east of Tobolsk. It has modern fortifications in the form of a regular polygon, flanked with five bastions, and is the most important military station on the line of the Irtish. It is now (since 1838) the seat of government for Western Siberia. It contains a school for interpreters and a military school for the Cossacks. The trade, carried on chiefly with the Kirghiz, is of considerable extent, and consists chiefly in brandy, tobacco, &c., for which cattle are given in exchange. Pop. 30,890, including many exiles.

ON. See HELIOPOLIS.

ONAGER. See ASS.

ONAGRACEÆ, the Evening Primrose order, consisting of herbaceous plants or shrubs, and distinguished by a two to four celled ovary, tetramerous flowers, petals twisted in æstivation, valvate calyx, definite stamens, horizontal or ascending ovules, and flat cotyledons much larger than the radical. The leaves are alternate or opposite, simple, entire or toothed; and the flowers, red, purple, white, blue, or yellow, are axillary or terminal. Among the genera are included *Jussiæa*, *Epilobium*, *Œnothera*, *Circæa*, and *Fuchsia*. The species are natives chiefly of the temperate zones, more especially America. A large number, however, belong to Europe, and not a few are found in India. In Africa, with the exception of a few widely-diffused jussiæas, they are mostly confined to the Cape. They are not of much economical value. *Œnothera* and some others are cultivated for their edible roots. The leaves of the *Jussiæa Peruviana* form an emollient poultice, and *Jussiæa caparosa* is used in Brazil to dye black. The fruits of several of the fuchsias are edible, and their wood is occasionally used as a dye-wood. In general all the plants of the order are ornamental and much cultivated in gardens. Many species of *Œnothera* having yellow flowers, which expand only in the evening, have received the name of evening primroses.

ONEGA, a river in Russia, which, issuing from Lake Latcha, government of Olonetz, flows first north-east, then north-west, and after a course of about 270 miles, so much broken by falls and rapids that it cannot be considered as navigable, falls into the White Sea at the south-east extremity of the Gulf of Onega.

ONEGA, a lake in Russia, near the centre of the government of Olonetz, and, after Lake Ladoga, the largest lake in Europe, covering an area of about 4900 square miles. It is of very irregular shape, has generally rocky shores, and numerous creeks, bays, and islands, and is well supplied with fish. Its waters are beautifully clear, but numerous shoals and sand-banks interrupt its navigation. It is fed chiefly by the Migra, Shuia or Shuisk, Vodla, and Vytegra, and discharges itself into Lake Ladoga by the Svir. A canal between the Vytegra and the Kayla, an affluent of Lake Bielo, gives it an opening into the basin of the Volga.

ONEGA, a town in Russia, in the government of Archangel, at the mouth of the river of the same name, 90 miles south-west of the town of Archangel, founded in 1780. It has a small harbour, at which some corn and much timber and fish are exported. Pop. 2329.

ONEGLIA, a seaport town, Kingdom of Italy, at the mouth of the Impero, in the province of Porto Maurizio and 55 miles south-west of Genoa. It is fortified, has several squares lined with elegant mansions, and a magnificent church; manufactures soap, playing-cards, and leather, and exports a good deal of olive-oil, wine, and fruits. Pop. 8047.

ONEIDA, a lake in the United States, in the state of New York, the western and lower end of which is about 18 miles south-east of Lake Ontario. It lies nearly east and west, is 20 miles long and 4 miles broad. Its waters find a vent by Oneida River into Lake Ontario at its south-east corner after they have united with the Seneca and formed the Oswego River. It is a very beautiful sheet of water, and abounds in fish.

ONION (*Allium*), a genus of liliaceous plants, including, besides the common onion, the echalot or shallot, garlic, and leek. The species of *Allium* are herbaceous plants with biennial or perennial bulbous roots. Their leaves are flat or cylindrical, and fistulous, and sheathing at base. The flowers are disposed in simple umbels, more or less dense, at the summit of the stems. The perianth is deeply parted into six equal divisions, and the stamens are six in number; the capsule consists of three cells, each containing several seeds. In the place of the flowers there are frequently developed in certain species small bulbs, which, if planted, will reproduce the vegetable. About sixty species are known. The onion proper (*A. Cepa*) is abundantly cultivated throughout Europe and in the United States of America. The stem is 3 or 4 feet high, inflated, and terminated by a dense globose head of reddish flowers; the leaves are radical, cylindrical, and hollow. Its use as an alimentary plant is well known. The red variety is more acrid than the white, and both become essentially milder in warm climates. Most of the Alliums contain a sulphuretted oil and free phosphoric acid. The onion requires a rich and rather moist soil.

ONKELOS, the author of the celebrated Targum or Chaldee paraphrase of the Pentateuch which bears his name, is asserted by the Babylonian Talmud to have lived in the time of the celebrated teacher Gamaliel, but is supposed from internal evidence to be not earlier than the second and not later than the third century. As his Chaldee is much purer than that used in Palestine he is conjectured to have been a native of Babylon. His version is so faithful, and accords so exactly with the Hebrew text, that it continued till the beginning of the sixteenth century to be chanted in the synagogue alternately with the Hebrew and to the same notes. An argument against its early date has been founded on the fact of its not being mentioned either by Origen or Jerome; but the satisfactory answer is that the one did not know Chaldee, and the other learned it only late in life. It has often been printed either with or without the Hebrew text. The oldest edition known is that published at Bologna (1482) with the Hebrew text and the commentary of Sal. Jarchi; the latest that of Jer. Heinemann (Berlin, 1831–35), containing also a German version by Mendel. There are at least three Latin versions of it, that of Alphonso of Zamora, contained in the Complutensian, Antwerp, Paris, and London (Walton's) Polyglotts, and elsewhere; that of Fagius, published at Strasburg in 1546; and that of Bernardin Baldi, which still remains unpublished.

ONOMACRITOS, in ancient Greece, a famous soothsayer and poet, who lived at Athens in the time of the Pisistratidæ, arranged and explained the prophecies or so-called oracles of Musæus, and having been detected making an interpolation in one of these oracles, was banished from Athens by Hipparchus about B.C. 516. He is supposed to have been the real author of some of the pieces which, in the time of Herodotus, went under the name of Orpheus. He is said, when banished, to have withdrawn to Persia, where the Pisistratids again took him into favour, and employed him to encourage Xerxes to make his expedition into Greece by repeating to him such ancient oracles as seemed to promise success. When he died is not known.

ONOMASTICON, a Greek term properly meaning a list of names or words, denotes particularly a dictionary or encyclopedia, in which individual subjects or things are mentioned and explained under their own names or head, according to systematic arrangement, which was not originally, as it now is, the order of the alphabet. The oldest work under this name still extant is that of Pollux, executed in the second century B.C. by Pollux, in the Greek tongue. It treats, in a desultory manner, of various subjects of a religious, civil, economical, and artistic nature. Among the later works of the name may be mentioned Glandorp's Onomasticon Historiæ Romanæ (Frankfort, 1589), in which historical accounts are given of the most famous Roman names and families; Saxe's Onomasticon Literarium (eight vols. 1775–1803), which still continues to be a valuable source for literary history; and, still more recently, Orelli and Baiter's Onomasticon Tullianum (three vols. Zurich, 1836–38), containing, besides the life and literary history of Cicero, the geographical and historical names, a list of the laws referred to.

ONOMATOPŒIA (Greek, *onomatopoiia; onoma*, a name, and *poiein*, to make), the formation of words in such a manner that the sound shall imitate the sense. Thus, in the case of sounds, the words *buzz, crash, roar*, are evidently formed to imitate the sounds themselves; sometimes the word expressing an object is formed to imitate the sound produced by that object. See ETYMOLOGY and LANGUAGE.

ONOSANDER, one of the most celebrated writers on military tactics among the ancients, lived in the middle of the first century of our era at Rome, during the reigns of Claudius and Nero, and composed in Greek, under the title of Strategetikos, an excellent work on the art of war, as illustrated by the experience of the Romans. The best editions are Schwebel's (Nürnberg, 1762) and that of Korais (Paris, 1822). A German translation, with plans and illustrations, was published by Baumgärtner (Mannheim, 1779).

ONTARIO, the most populous province of the Dominion of Canada, formerly called Upper Canada and Canada West. See CANADA.

ONTARIO, LAKE, the most eastern of the great lakes of North America, lying along the north-east side of the state of New York, and forming part of the boundary between the United States and Canada; length, above 180 miles; greatest breadth, above 50 miles; circumference, about 480 miles; area, estimated at 5400 square miles. It receives the waters of Lake Erie by the Niagara, and discharges its waters by the St. Lawrence into the Atlantic, 1000 miles distant. Its surface is 334 feet below that of Lake Erie, with which it is connected by the Welland Canal as well as by the Niagara. The Hudson, and the Oswego and Erie canals, form a connection through the United States between it and the Atlantic. It is navigable throughout its whole extent and at all seasons, as on account of its depth—in some places more than 600 feet—it rarely freezes. Many ships and steamers are employed upon it. The most important places on its shores are Oswego and Sackett's Harbour, in the United States; and Kingston, Toronto, Hamilton, and Coburg, in Canada.

ONTENIENTE (ancient, *Fonteniente*), a town in Spain, in the province of Valencia, and 46 miles south of the town of Valencia, on the right bank of the Clariano, with a palace of the dukes of Almodovar. The manufactures are woollen and linen cloth, delftware, &c., and there are numerous fulling, corn, and oil mills. Pop. 11,727.

ONTOLOGY, the doctrine of being; a name given to that branch of metaphysics which treats of the essential qualities of things.

ONYX, a variety of quartz (which see) in which the colours are arranged in flat horizontal planes.

OOJEIN. See UJEIN.

OOLITE. See GEOLOGY.

OOMRAWATEE, AMRAWATI, or AMRAOTI, a town in India, in East Berar, 97 miles west of Nagpur. There is a station of a branch line of the Great Indian Peninsula Railway at this place. The principal trade is in cotton. Some valuable Buddhist sculptures were found here, and have been transferred to the Calcutta and India Office museums. Pop. 23,410.

OONALASHKA, or UNALASKA, one of the Aleutian Islands (which see).

OOST, JACOB VAN, the Elder, one of the best Flemish painters, born at Bruges in 1600. After laying the ground of his artistic education in his native land, he proceeded to Rome, and there became the pupil chiefly of Annibale Caracci. In his youth he was so successful a copyist of Rubens and Vandyck that his copies still deceive connoisseurs; in this way he learned the principles of beautiful colouring and a graceful command of the pencil. At a later period he painted only large historical pieces. He adorned his back-grounds with architecture, with which, as well as with perspective, he was well acquainted; his design is in good taste, and his flesh colourings fresh and natural. He died in 1671.—JACOB VAN OOST, the Younger, son of the preceding, born in 1637, studied at Paris and Rome, then lived above forty years at Lille, and died at Bruges in 1713. Large historical paintings by him are in the churches and palaces at Lille. He excels both in design and colouring. His style is more marked, and his pencil is freer than that of his father. His draperies are in the grandest style.

OOSTERHOUT, a town in Holland, in the province of North Brabant, 5 miles north-east of Breda. It has potteries, breweries, tanneries, corn-mills, a building-yard, and a hat factory; and some trade in grain, cloth, and tin.ber. Pop. (1880), 9853.

OOTACAMUND, a sanitary station in Southern Hindustan, in the province of Malabar, in the Neilgherry Hills, 70 miles south of Mysore. It is 7400 feet above the level of the sea. The mean temperature is about 58° Fahr.

OPAL, or HYDRATED AMORPHOUS SILICA, occurs in small reniform, botryoidal, and stalactitic shapes, and large tuberose concretions; surface of the former smooth, of the latter rough; composition impalpable; fracture conchoidal, even. It also occurs in pseudomorphs of carbonate of lime; fracture conchoidal, of various degrees of perfection, sometimes highly perfect; lustre vitreous, in some varieties inclining to resinous; colour, white, yellow, red, brown, green, and gray; none of them lively, except some red and green ones; dark colours, owing to foreign admixtures; streak white; transparent or translucent, sometimes only on the edges, or even opaque, if the colours be very dark; lively play of light observable in some varieties; others show different colours by reflected and transmitted light; hardness below quartz; specific gravity 2·091. Opal, when pulverized, dissolves in hot caustic potash, a character by which it is distinguished from quartz, or crystallized silica. The chief varieties of opal are, 1, *noble opal*, which exhibits brilliant and changeable reflections of green, blue, yellow, and red; 2, *fire opal*, which simply affords a red reflection; 3, *common opal*, whose colours are white, green, yellow, and red, but without the play of colours; 4, *semi-opal*, the varieties of which differ from those of common opal in being more opaque; 5, *wood opal*, which appears in the shape of trunks, branches, and roots of trees; 6, *hydrophane*, a variety without transparency, but assuming it if thrown into water; 7, *hyalite*, which occurs in small reniform, botryoidal, and some-

times stalactitic shapes, and is transparent; 8, *menilite*, which occurs in tuberose masses, and is opaque; 9, *siliceous sinter*, which is merely a deposit from a hot spring. Three varieties of opal, 1, hyalite, analyzed by Bucholz, 2, precious opal, and, 3, menilite, both analyzed by Klaproth, have yielded—

Silica	1. 92·00.	2. 90·00.	3. 85·50.
Water	6·33.	10.	11.

The last contains, like several other varieties, a small proportion of iron, alumina, lime, and carbon. Before the blowpipe water is disengaged, the mineral decrepitates and becomes opaque, and shows the properties of pure silica. Opal is less frequently met with in nature than quartz. Generally it forms short irregular veins, which, for the most part, are found in porphyry. It accompanies chalcedony in the vesicular cavities of amygdaloid rocks, and even in agate balls. Menilite is found in adhesive slate. Some varieties are met with in metalliferous veins, and in petrifactions in sandstone. Almost the only locality of precious opal known is at Czarwenitza, in Hungary, where it is found in porphyry. It has also been met with in the Faroë Islands, and also near Gracias a Dios, in South America. Fire opal comes from Zimapan, in Mexico. Common opal is found in large quantity in Hungary, Saxony, and the Faroë Islands. An apple-green variety is found at Kohemutz, in Silesia, which is called *chloropal*. Hyalite is found in amygdaloidal rocks in Bohemia and Hungary, and also in the United States, in Georgia, lining cavities in the buhr-stone. Menilite occurs imbedded in adhesive clay at Menilmontant, near Paris. Wood opal is found at Kremnitz and Telkobanya, in Hungary, and in many districts of Transylvania. Precious opal is considered as a very precious gem, and is generally cut with a convex surface. Its value depends upon its size, purity, and the vivid colours which it possesses. The phenomenon of the play of colours has not hitherto been satisfactorily explained. According to Hauy it is the consequence of fissures in the interior filled with thin films of air, which reflect coloured light according to the law of Newton's coloured rings. If this were the fact, opal would present nothing else but a kind of irridescence, and the beauty of opal would be owing, as Hauy expresses it, only to its imperfections. But these colours often keep constant directions within single parts of the mass; and in specimens not cut in the usual convex form, but presenting even faces, it is often possible to observe distinct images reflected exactly as in the moonstone or in corundum. The play of colours seems, therefore, to be connected with the regular structure of the mineral.

OPERA. An opera is a musical drama. The music makes an essential part of it, and in this it is distinguished from other dramas accompanied by music. Song and music may be said to be the poetry of the opera, and though the opera remains a drama, and never ought to lose this character, yet as music is lyrical, the opera must be principally directed to the expression of feelings and passions. Comparatively little display of character and action can be expected from it. An opera, like every work of art, must bear the stamp of unity; one character must prevail through the whole, as the solemn and grave in Mozart's Magic Flute (though there are *naïf* passages interspersed in it), or the glowing, vivid colouring of Figaro, or the heroic elevation of Gluck's Alceste. It is further necessary to give individuality of character by means of the music, and the lyrical monologues (airs, *cavatine*, *ariosi*) and dialogues (duets, *terzette*, &c.) must alternate in pleasing variety. But our limits do not allow us to give a description of the various parts requisite to these exquisite productions. According as the serious or the comic character prevails in the opera, it is termed *opera seria* or *opera buffa*. There is also a style—*mezzo stilo*—between both, the limits of which it is, of course, impossible to define. *Grand opera* is the name given to that kind which is confined to music and song. The *recitativo* is an essential part of this. By *operetta* is understood a short musical drama of a light character. The French *vaudeville* belongs to this species of compositions, but not the German melodrama, in which music, indeed, is introduced either by itself or in connection with the dialogue, but no singing takes place.

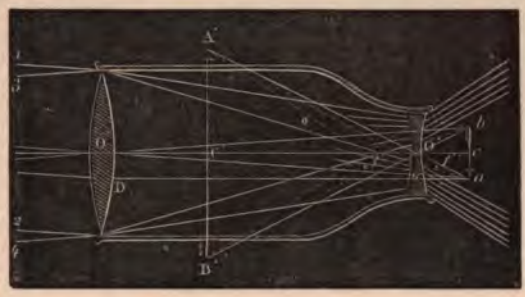
The opera arose in Italy. Like the regular drama it is probably a development of the Mysteries of the middle ages. These pieces had frequently songs introduced into them, and sometimes towards the close of the period of their prevalence whole pieces were sung, or rather chanted. The first piece performed in this way is said to have been one called the Conversion of St. Paul, brought out in 1440. In 1508 a piece called Calandra, which was set to music, was performed at Urbino, and in 1514 the same piece was performed before Leo X. at Rome. Galileo, the father of the astronomer, a good many years later produced at Florence his Ugolino, a kind of lyric drama closely resembling the modern opera, the subject of which was taken from a well-known episode in Dante. About this period, however, other modes of theatrical representation were almost entirely displaced by the pastoral dramas, in which only the prologues and choruses were sung. It was not till near the close of the sixteenth century that the invention of recitative or spoken music came in to complete the Italian opera. About this time three young noblemen of Florence, who were attached to each other by a similarity of tastes and pursuits, and a love of poetry and music, conceived the idea of reviving the chanted declamation of the Greek tragedy: they procured the poet Rinuccini to write a drama on the story of Daphne, which was set to music by Peri, the most celebrated musician of the age, assisted by Count Giacomo Corsi, who, though only an amateur, was also, for the period, a good musician: the piece, like the Mask of Comus, was privately represented, and in the palace of Corsi. The interlocutors, or singers, were the author and his friends; and the orchestra of his first opera consisted but of four instruments, namely, a harpsichord, a harp, a *viol di gamba*, and lute. There was no attempt at airs, and the recitative—if such it could be called—was merely a kind of measured intonation, which would appear to us insufferably languid and monotonous; yet it caused at the time an extraordinary sensation, and was frequently repeated. Some years afterwards the first public opera, entitled Euridice, written by the same poet, and set by the same musician, was represented at the theatre of Florence, in honour of the marriage of Maria de' Medici with Henry IV. of France. On this occasion the introduction of Anacreontic stanzas, set to music, and a chorus at the end of each act, were the first imperfect indications of the airs and choruses of the modern opera. Monteverde, a Milanese musician, improved the recitative by giving it more flow and expression; he set the opera of Ariadne, by Rinuccini, for the court of Mantua; and in the opera of Giasone, set by Cavalli and Cicognini, for the Venetians (1649), occur the first *airs* connected in sentiment and spirit with the dialogue. The commencement of the *opera seria* at Rome reminds us of the waggon of Thespis and his lees-besmeared company of strollers. The first performance of this kind, consisting of scenes in recitative and airs, was exhibited in a cart during the carnival of 1606 by the musician Quagliata, and four

or five of his friends. The first regular serious opera was performed at Naples in 1615; it was entitled Amor non ha Legge. During the second half of the seventeenth century the opera not only did not improve, but it degenerated: it became in Italy what it was in France during the last century—a grand spectacle addressed to the eye, in which the poetry and music were the last things considered, while the scenery, mechanical illusions, and pantomime were on the most splendid scale. As Goldoni said long afterwards of the grand opera at Paris, 'C'était le paradise des yeux et l'enfer des oreilles.' The first *opera buffa* is said to have been represented at Venice in 1624, where also the first stage for operas was erected in 1637. In 1646 the opera was transplanted to France by Cardinal Mazarin, about the same time to Germany, and somewhat later to England. In France there arose Lulli; in Germany (Hamburg), Keiser; in Italy, Scarlatti, and in England, Purcell, who are the chief operatic composers of the second half of the seventeenth century. In the eighteenth century Handel appeared, and effected a complete revolution on English opera, but did not exert a permanent influence. The Italian opera did not penetrate into Spain until the second half of the eighteenth century. The Italians draw the line between the *opera seria* and *opera buffa* much more distinctly than the Germans, so that the Italian *opera seria* appears almost insipid to a German; the *buffa*, on the contrary, is quite grotesque and quite national, and produces a lively effect when played by Italians.

The chief Italian operatic composers include, besides those already mentioned, Sacchini, Piccini, Jomelli, Cimarosa, Paisiello, Cherubini, Rossini, Bellini, Donizetti, Verdi, &c. Among the French composers are Grétry, Monsigny, Rousseau, Méhul, Boieldieu, Auber, Halévy, Herold, A. Thomas, and Gounod. The chief recent composers of French comic operas are Offenbach, Lecoq, Hervé, and Bizet. The principal French Librettists are Quinault, La Fontaine, Marmontel, Favart, Sedaine, Étienne, Scribe, Théaulon. Two of the most noted English operas are the Beggars' Opera by Gay, and Love in a Village by Bickerstaff. Among English composers of operas may be mentioned Arne and Shield, and of the present time, Balfe, Wallace, Macfarren, Sullivan, Mackenzie, Thomas, and Stanford.

The German opera, as it now exists, originated from the *operetta*, chiefly cultivated in the latter half of the eighteenth century by Weisse and Hiller. The pieces which are sung became longer and longer, so that at last they took the form of the *opera seria;* and when the *finale*, invented by the Italians, was introduced, general preference was given to that kind of opera. Spoken dialogue and song alternate in it. The romantic opera is a German production, in which comic scenes alternate with those of a more serious cast. Among the most perfect of the German romantic operas are Die Zauberflöte (the Magic Flute), Don Juan, Der Freischütz, Oberon, &c. Some of the poets who have written for the German opera are Goethe, J. G. Jacobi, Herklots, Huber, Kotzebue, Schikaneder, Kind, Gehe, &c. The German composers are Gluck, Hasse, Mozart, Winter, Weigl, Reichardt, Kunzen, Vogler, Beethoven, Weber, Spohr, Flotow, &c. Meyerbeer, though German by birth, is to be classed rather with the French composers. In the most recent school of German operatic composition, at the head of which stands Richard Wagner, the vocal music of the piece is deprived of the prominent place formerly assigned to it, and is made subordinate to the other three elements of an opera—text, instrumentation, and scenic decoration.

OPERA-GLASS, an instrument in common use for viewing objects which are at a moderate distance away; it generally consists of two Galilean telescopes. The Galilean telescope has a double-convex object-glass and a double-concave eye-glass; in the figure the first is shown at O, and the second at O′K. The object-glass would form an inverted image of a distant object at *a b*. (See Optics.) The rays leaving O do not, however, form the image *a b*, because they pass through the concave lens O′, which renders them divergent. The rays which would have met at *b* are made to diverge, and seem to have come from the point B′; similarly the rays which would have met at *a* are made to diverge, and seem to have come



from A′. Thus at A′B′ there is an erect, magnified, virtual image of the distant object. By means of a screw we may regulate the distance asunder of O and O′, so as to have A′B′ at the distance of distinct vision from an eye in front of O′. The distance between the lenses is about equal to the difference between their respective focal distances, and hence this telescope is short and portable. It shows objects upright and magnified from two to three times. As it has only two lenses, nearly all the light which falls on the object-glass enters the eye, and hence the image is bright. Galileo's was the first telescope directed to the heavens; by it Galileo discovered the mountains of the moon, Jupiter's satellites, and the spots on the sun. An opera-glass consisting of two of these telescopes forms two images of the object, one in each eye, so that the impression of relief due to binocular vision is obtained. (See Eye, Stereoscope.) The eye-glasses are attached to one another, and are moved with respect to the object-glasses by means of a screw. In some instruments three eye-glasses are attached to a shifting frame, so as to present three different powers—a very convenient arrangement. In the best instruments both object-glasses and eye-glasses are achromatic combinations of three pieces, the middle piece in each case being of flint and the others of crown glass.

As the image formed by the eye-piece is virtual in the Galilean telescope, cross wires cannot be used as in other telescopes. See Telescope.

OPERCULUM, the horny or limy plate developed upon the 'metapodium' or hinder portion of the 'foot' of many gasteropodous molluscs. Its function is that of closing the mouth or aperture of the shell when the animal has withdrawn into its abode. See Mollusca.

OPHICLEIDE, a musical bass instrument wholly composed of brass, and very effective in military bands. It has many advantages over the serpent, which it has almost entirely superseded. It has a large compass of notes, and has a strong and powerful tone, stronger than the bassoon, but duller and not so quavering. The ophicleide used in military bands is on the key of B flat; that used in orchestras is on the key of C, and has a compass of three full octaves,

with all the intermediate semitones rising from the C given by the fourth open string of the violoncello.

OPHIDIA. See SERPENTS.

OPHIR, a country or city to which the Hebrews made voyages in the time of Solomon, starting from Ezion-geber at the head of the north-east branch of the Red Sea, now called the Gulf of Akabah, and bringing home gold, almug-wood, and precious stones. Commentators are not agreed as to its situation. Some identify it with the Ophir mentioned in Gen. x. 29, which was apparently situated in Arabia; while others place it in India, or even in Africa.

OPHITES, a Gnostic sect which rose in the second century, and held, in common with the Valentinians (see GNOSTICS), the doctrines of the two principles of *œons* and of the theogony therewith connected. They were peculiar in the worship of a living serpent, which they regarded as having liberated man, through the seduction of Eve, from the power of Jehovah, whom they, like most other Gnostics, regarded with abhorrence.

OPHIUCHUS, or SERPENTARIUS and SERPENS, one of the old constellations, which was anciently called ÆSCULAPIUS.

OPHTHALMIA (Greek, from *ophthalmos*, an eye), an inflammation of the mucous membrane which covers the globe of the eye, and of the correspondent surface of the eyelids. It is either acute or chronic. It differs very much in its exciting causes. Residence in damp or sandy countries, exposure to the sun, sudden changes of weather, are among the most usual causes. It may also be produced by the suppression of some of the usual discharges, and also by the scrofulous and venereal virus. Its characteristic marks are pain, redness, a feeling as if sand were in the eye, and intolerance of light. Of all diseases of the eye it is most frequent.

OPHTHALMOSCOPE, an instrument for observing the structure of the eye. The first instrument of the kind was invented by Helmholtz in 1851, but those now generally in use are the improved instruments of Coccius, Desmarres, Galezowski, and Giraud-Teulon. Most of these consist of a mirror (plane in that of Coccius, concave in that of Desmarres), by which a ray of light is directed on the eye of the patient, and a double convex lens, by which the illumined parts of the structure of the eye are enlarged in order that they may be more easily examined. The observer looks through a hole in the centre of the mirror. The examination must take place in a room lighted only by a single lamp, which is placed on a level with the patient's eye on his right or left hand, according as the eye which is to be examined is the right or the left one. The patient's eye is prevented from receiving the direct rays of the lamp by the interposition of a metal plate. The operator having placed the patient in front of him, and with one hand directed the light reflected from the mirror on the eye which he wishes to observe, adjusts the convex lens, which he holds in the other hand until he gets the proper focus. He then looks for the entrance of the optic nerve, which he sees as a white disk, from which proceed the central vein and artery of the retina, giving off six or eight branches. This is the part which it is most necessary to examine, but all the other parts of the internal structure of the eye may be observed in the same way. The patient must change the position of his eye until the observer has the part he wishes to examine within the range of his reflected ray and convex lens. The ophthalmoscope of Giraud-Teulon differs from those of Coccius and Desmarres in having an arrangement behind the mirror which enables the operator to use both his eyes in making the observations. The construction of Galezowski's instrument is totally different, and is such as to admit of its being used in a light room. Whichever instrument is used, considerable practice is required in the observation of sound eyes before the operator is able to use it effectively in detecting disease in the eye.

OPIE, AMELIA, a distinguished authoress, was the only child of Dr. Alderson, a physician at Norwich, and born there on 12th November, 1769. In 1798 she married John Opie, the well-known painter, and from this period began, under the encouragement of her husband, to come frequently before the public as an authoress. She had already published some poetry and an anonymous novel, The Dangers of Coquetry, but these attracted no attention. In 1801 she gave to the world her tale entitled Father and Daughter, the pathos and interest of which soon procured for it an extended popularity. Few scenes in romance writing are more thrilling than the description of Agnes traversing the forest with her child at midnight, and recognizing her father in the escaped lunatic. In 1802 she published a volume of poems, marked by much grace and tenderness. Adeline Mowbray, or Mother and Daughter, appeared in three vols. in 1804, and Simple Tales in four vols. in 1805, both of which publications added considerably to her reputation. In 1807 she lost her husband, and thereupon returned to her father at Norwich, where she continued to reside to the end of her life, and where she died on the 2d of December, 1853. Her remaining literary works comprise The Warrior's Return and other Poems, published in 1808; a Memoir of her husband, prefixed to his Lectures on Painting, edited by her in 1809; Tales of Real Life, in 1813; Madeline, in 1822; Illustrations of Lying, in 1825; Detraction Displayed, in 1828; Lays for the Dead, in 1833; and an account of a tour made by her in Belgium and Switzerland in 1835, contributed by her to Tait's Magazine for 1840. A Life of Mrs. Opie was published by her friend Miss C. L. Brightwell.

OPIE, JOHN, professor of painting at the Royal Academy, was born in 1761 in Cornwall. His father was a carpenter, and he was intended for the same occupation, but when very young he manifested a taste for study and a strong predilection for the arts of design. When about nineteen he was taken to London by Dr. Wolcott (Peter Pindar), who had discerned his talents, and had befriended him previously in various ways. Through the influence of his patron he rapidly acquired great notoriety, and became known as the *Cornish Wonder*. The whole fashionable world for a time were anxious to have their portraits painted by him, and while this season of distinguished favour lasted, which it did only for a short time, he managed to realize a moderate fortune. When his time was no longer wholly taken up by portrait-painting he devoted himself to historical painting, and produced his Murder of James I. of Scotland, Slaughter of Rizzio, Jephtha's Vow, &c. His Slaughter of Rizzio was exhibited in 1787, and secured his election to the rank of associate of the Royal Academy. In 1788 he was appointed a Royal Academician. In 1798, having previously obtained a divorce from his first wife, he married Amelia Alderson, the celebrated novelist, better known as Mrs. Opie. In 1805 he was elected the successor of Fuseli as professor of painting in the Royal Academy, but only delivered four lectures in February and March, 1807, before his death, which took place at London on the 9th of April, 1807. His four lectures on painting, with a memoir by his wife, were published in 1809. He is also the author of the biography of Sir Joshua Reynolds in Wolcott's edition of Pilkington's Dictionary of Painters, and of An Inquiry into the Requisite Cultivation of the Arts

in England, originally published in the form of a letter to the North Briton on the formation of a national gallery.

OPINION OF COUNSEL, the advice given by a barrister or advocate in answer to questions put with regard to a 'case' or 'memorial' prepared by an attorney or solicitor. No damages are obtainable for a wrong opinion given in this way.

OPISTHOBRANCHIATA. See NUDIBRANCHIATA and MOLLUSCA.

OPITZ, or OPITIUS, MARTIN, a celebrated German poet of the seventeenth century, born at Bunzlau in Silesia in 1597, published first a collection of Latin poems, entitled Strenarum Libellus, in 1616. The following year he became a teacher at the gymnasium of Beuthen, on the Oder, and besides poetical compositions, he published his Aristarchus, sive de Contemptu Linguæ Teutonicæ (4to). He then studied at Frankfort-on-the-Oder and at Heidelberg, and having afterwards visited Holland, he went in 1621 to the court of the Duke of Liegnitz, whence in about a year he removed to become professor of philosophy and classical literature at the University of Weissenburg (now Karlstadt), then newly founded by Bethlen Gabor. The situation proving unpleasant, he soon returned to Bunzlau, and afterwards to the service of the Duke of Liegnitz. Becoming distinguished for his talents, he went in 1625 to Vienna, where the Emperor Ferdinand II. is said to have bestowed on him the poetical crown. Returning again to Silesia, he became secretary to the Burgrave of Dohna. In 1627 he received from the Emperor Frederick II. letters of nobility, when he assumed the title of Von Boberfeld. In 1630, on the occasion of an embassy to Paris in the service of the Burgrave of Dohna, he made the acquaintance of Hugo Grotius. Soon after his return from this embassy his master died (1633), and two years after this he went to settle at Danzig, where in 1637 he was appointed historiographer to the King of Poland. He died at Danzig, August 20, 1639. Among his works are a poem on Mount Vesuvius, Silvæ, Epigrams, &c. Opitz was the creator of a new and more correct poetical style in Germany, founded on the model of the ancient classics, and of a form of versification accommodated to rules of prosody, and resting on the measure of syllables and not their number. He was well acquainted with classical literature, and had stored his mind with useful knowledge, so that his poems, especially the larger ones, are rich in thought and invention. The language is indebted to him for new connections and forms, greater smoothness and correctness, expressiveness, and euphony. A good selection from his works appeared in the first volume of Wilhelm Müller's Bibliothek deutscher Dichter des 17ten Jahrhunderts (Leipzig, 1822).

OPIUM, the inspissated juice of a species of poppy (*Papaver somniferum*), a native originally of the East, but now naturalized throughout the greater part of Europe. The root of this plant is annual, giving out a stem from 2 to 4 feet high, which, as well as the leaves, is glaucous. The flowers are terminal, white or light gray, and 3 or 4 inches in diameter; in the wild plant they are provided with only four petals, but in the double varieties the petals are numerous, and vary in colour from white to red and to deep violet, with intervening shades. The capsules contain a prodigious number of seeds. The poppy is found in most gardens as an ornamental plant, and is cultivated extensively in many parts of Europe, but only for the sake of the oil which is obtained from the seeds. It is from the East, from different parts of the Turkish Empire, and from Hindustan, that the opium of commerce is chiefly procured. That imported into Great Britain comes principally from Turkey. The quantity imported in 1882 was 478,624 lbs., of which 359,560 lbs. came from Turkey. The value was £350,150. In the same year the value of opium exported from British India amounted to £12,432,142. It is also an important source of revenue, being partly grown on government account, and where grown in the native states subjected to a heavy export tax. It is grown chiefly in Bahar, the north-west provinces (especially the Benares division), and Oudh; and in Malwa and Gujerat, which belong to native states. The total revenue derived from it in 1881–82 was £9,862,444, or about one-sixth of the whole revenue of India. Most of it is exported to China and South-eastern Asia.

The finest opium is obtained by making longitudinal incisions in the green capsules in the evening; the milky juice which flows out is suffered to remain till the following evening to acquire consistence, when it is removed, and the process repeated. When the seeds are the sole object the time of sowing is in the autumn, and at the end of the following July or beginning of August the crop is ready for harvesting. Before cutting off the capsules it is better to shake them on cloths spread for the purpose; or if this precaution is not taken, they should be removed with great care, keeping them always in an upright position until they are placed in sacks; otherwise a portion of the seed will be lost. The capsules should then be exposed to the air to complete their desiccation, and the seed, after being separated, should be kept in a dry place. The oil has an agreeable taste, and after olive-oil, is esteemed the best for culinary purposes. In Germany and the Netherlands it is almost the only kind used. The seeds, after being roasted and prepared in various manners, were employed by the Romans in making several sorts of cakes and dainties; and this custom is still prevalent in some parts of the north of France.

Opium is the most energetic of narcotics, and at the same time one of the most precious of all medicines, and is employed in the greatest variety of cases. It is invaluable in procuring relief from pain at all times. It is most commonly employed for the purpose of procuring sleep; but its habitual use is attended with similar, if not worse effects, than the abuse of ardent spirits. A full dose is intoxicating and exhilarating, but if taken in large quantities it produces dangerous and fatal effects. An emetic should be immediately resorted to in such cases. Laudanum is a liquid preparation of opium made with alcohol, and is similar in its effects on the human system. Madden, in his Travels in Turkey, &c., speaking of the opium eaters of Constantinople, whom he saw in a coffee-house frequented by them, says, 'Their gestures were frightful; those who were completely under the influence of the opium talked incoherently, their features were flushed, their eyes had an unnatural brilliancy, and the general expression of their countenances was horribly wild. The effect is usually produced in two hours, and lasts four or five. The dose varies from 3 grains to a drachm. The debility, both moral and physical, attendant on its excitement is terrible: the appetite is soon destroyed, and every fibre in the body trembles; the nerves of the neck become affected, and the muscles get rigid. Several I have seen in this place who had wry necks and contracted fingers, but still cannot abandon the custom. They are miserable till the hour arrives for taking their daily dose.'

This very strong description of the evils produced by the habitual use of opium is not, however, fully borne out by the experience of other observers, at least so far as the moderate use of the drug is concerned. Mr. Crawfurd, for instance, a very compe-

tent authority on the subject, states (Dictionary of the Indian Islands, &c.), 'Like any other narcotic or stimulant, the habitual use of it is amenable to abuse, and as being more seductive than other stimulants perhaps more so; but this is certainly the utmost that can be safely charged to it. Thousands consume it without any pernicious result, as thousands do wine and spirits without any evil consequence. I know of no person of long experience and competent judgment who has not come to this common-sense conclusion.' He then quotes the opinion of Dr. Oxley, long resident at Singapore, where the rate of consumption of the drug is very high. Dr. Oxley's statement is—'The inordinate use, or rather abuse, of the drug most decidedly does bring on early decrepitude, loss of appetite, and a morbid state of all the secretions; but I have seen a man who had used the drug for fifty years, in moderation, without any evil effects; and one man I recollect in Malacca who had so used it, was upwards of eighty. Several in the habit of smoking it have assured me that, in moderation, it neither impaired the functions nor shortened life; at the same time fully admitting the effects of too much.' The testimony of Sir Benjamin Brodie is also to the same effect. With regard to its consumption in China Mr. Crawfurd remarks that though the Chinese do in the aggregate consume a very large quantity, yet the amount consumed by individuals is on the average not very great—much less than at Singapore, and therefore that it cannot have those deleterious effects on the people so commonly attributed to it.

There has been a considerable amount of discussion with regard to the immediate effects of opium on the mind and nervous system, and some have doubted or denied the existence of those dreams or visions which are alleged to prove so seductive to the opium-eater. Dr. Christison, however, in his work on Poisons, states his full belief in the latter, and with regard to these and other effects of the drug on the system makes the following remarks:—'A very poetical, but I believe also a very faithful picture of the phenomena now alluded to, is given in the Confessions of an English Opium-eater (see DE QUINCEY), a work published not long ago by a gentleman who writes from personal experience. It is singular that our profession should have observed these phenomena so little as to be accused by the author of having wholly misrepresented the action of the most common drug in medical practice. In reply to this charge the physician may simply observe that he seldom administers opium in the way practised by the opium-eater; that when given in the usual therapeutic mode it rarely causes material excitement; that some professional people prefer giving it in frequent small doses, with the view of procuring its sedative effect with greater certainty, and undoubtedly do succeed often in attaining their object; that in both of these medicinal ways of administering it excitement is occasionally produced to a very great degree, and of a very disagreeable kind; that the latter phenomena have been clearly traced to idiosyncracy; and therefore that the effects on opium-eaters are probably owing either to the same cause or to the modifying power of habit. This much at all events is certain, that opium seldom produces a material excitement in a single small dose; and does not always cause continuous excitement when taken after the manner of the opium-eaters. The effects of a full medicinal dose of 3 grains of solid opium, or a drachm of the tincture, is to produce in general a transient excitement and fulness of the pulse; but in a short time afterwards torpor and sleep, commonly succeeded in six, eight, or ten hours by headache, nausea, and dry tongue.'

The habitual use of opium is exceptional in this country; but in China, the south-east of Asia, and the Malay Archipelago, it is very common. It is chiefly smoked and not eaten in these parts of the world, a special pipe, lamp, &c., being employed. Before it is suited for smoking it goes through several processes, which bring it into the form of a blackish viscous paste. The pipe, or rather the stem of the pipe, is made of heavy wood, and is about the length and size of an ordinary flute; the bowl is generally made of earthenware. The smoker, who is always lying, or at least reclining, takes a small portion of opium about the size of a pea on the end of a spoon-headed needle, heats it at the lamp, and then places it in the bowl of the pipe, the pellet of opium having previously been perforated with the needle. He then brings the opium to the flame of the lamp, inhales the smoke in several inspirations, and is then ready to repeat the process with a fresh quantity of opium. The smoke is exhaled through the nostrils. Old smokers are able to fill the lungs with it. The smell of the burning opium is rather sickening to those unaccustomed to it.

Opium contains a number of alkaloids, among which the principal are *narcotine*, *morphine*, *codeine*, *narceine*, *thebaine*, and *papaverine;* several organic acids, especially *meconic acid;* one or more neutral substances, *meconin*, *opium resin*, &c.; and a varying amount of inorganic material, *potash*, *lime*, *ammonia*, *magnesia*, &c., in combination with *hydrochloric*, *sulphuric*, *phosphoric*, and *silicic acids*. The proportions of these constituents vary in different samples; the following table exhibits the per centage amounts of morphine found in various kinds of opium:—

Smyrna.	Egyptian.	East Indian.	Persian Opium.	Algerian.	French.
12 to 14.	5·8 to 6·6.	5.5 to 7·7.	11·3.	2 to 17.	8 to 17.

In the annexed table will be found an average analysis of Smyrna opium:—

	Per Cent.
Morphine,	10·8
Codeine,	0·7
Narcotine,	6·8
Narceine,	6·7
Meconine,	0·8
Meconic acid,	5·1
Fat,	2·2
Caoutchouc,	6 0
Resin,	3·6
Gummy extract,	25·2
Gum,	1·0
Mucus,	19·1
Water,	9·8
	97 8

According to their physiological action, the opium bases may be divided into the three following classes, the most active in each class being placed first:—

Narcotic.	Exciting.	Poisonous.
Narceine.	Thebaine.	Thebaine.
Morphine.	Papaverine.	Codeine.
Codeine.	Narcotine.	Papaverine.
	Codeine.	Narceine.
	Morphine.	Morphine.
	Narceine.	Narcotine.

For a description of these alkaloids, &c., reference must be made to the various articles MORPHINE, CODEINE, &c.

OPODELDOC, a solution of soap and alcohol, with the addition of camphor and volatile oils. It is used externally against rheumatic pains, sprains, bruises, and other like complaints.

OPOPONAX, a gum resin, having a peculiar and rather disagreeable odour, formerly used in medicine. It is the produce of the *Opoponax Chironum*, and is brought from the Levant. The physicians of ancient

times, as Hippocrates and Theophrastus, highly esteemed it for its purifying and aperient virtues, but by modern medical men it is discarded as of little power. It still continues a famous medicine in the East, where it is looked upon as a cure for all diseases.

OPORTO (Portuguese, *O Porto*, The Port), a large city and seaport of Portugal, capital of the province of the same name, on a steep declivity on the right bank and about 2 miles from the mouth of the Douro, 170 miles north of Lisbon. The appearance of the city, on a first approach, is very prepossessing; the houses rise one above another in terraces, and being all white-washed, give it an air of great cleanliness; but in reality most of the streets are narrow, crooked, and dirty, and the houses irregularly constructed. Still there are quarters of the town where the houses are well built, and the streets broad and straight, and finely diversified with gardens full of vines and orange-trees. In one of the principal streets is situated the British Factory-house, a handsome building of white granite, with a beautiful façade; the theatre also is a very tasteful structure. There are eleven public squares, called *campos;* three or four nunneries; the monasteries, which were formerly very numerous, have since 1834 disappeared, are in ruins, or have been turned to other uses; ten hospitals, and ninety churches and chapels, including a spacious cathedral. One of the most striking architectural objects in Oporto is the Torre dos Clerigos (Tower of the Clergy), attached to the church of same name. The principal trade of Oporto is in wine, white and red, but chiefly the latter. The shipments of red port wine, in favourable years, amount to 40,000 pipes, four-fifths of which are sent to Great Britain. There are some manufactories of hats, silks, cotton, woollen, and linen stuffs, pottery, lace, buttons, gold and silver wire, glass, leather, and paper, besides rope-walks and dock-yards. Royal tobacco and soap works, iron-foundries, and several refineries are also in operation. The climate is damp and foggy in winter, and unhealthy from the beginning of July to the end of August. The heat during the day is quite oppressive, although a cold wind prevails on the river, and a chilling sea-fog comes up the Douro every evening at the turn of the tide. In ancient times the site of Oporto was occupied by the harbour town Portus Cale, afterwards Porto Cale, from which the name of the kingdom, Portugal, is derived. Oporto was capital of Portugal till 1174, when the seat of government was transferred to Lisbon. It was taken and sacked by the French in 1805, who retained possession of it till 1809, when the British crossed the Douro, and compelled them to retire. Having sided with Don Miguel, it was besieged in 1831–32 above a year by the troops of Don Pedro, when much of it was destroyed, and its trade was for the time annihilated. Pop. (1878), 105,838.

OPOSSUM (*Didelphys*). This well-known genus of marsupial mammals is noted as being the only member of that order which is found without the Australian province, the opossums inhabiting North and South America. The majority of the species included in the Opossum family (Didelphidæ) inhabit South America, only a single example, the Virginian Opossum (*Didelphys Virginiana*), being found in the northern portion of the continent, this particular form being at the same time the first discovered and described member of the curious order Marsupialia. The opossums belong to the entomophagous or insect-eating section of the marsupial order. Canine teeth of small size are always present, and the opossums are remarkable for the large number of incisor or front teeth they possess, as compared with other marsupials. The dental formula shows ten incisors in the upper, and eight in the lower jaw; and two canines, six premolars, and eight molars in each jaw—making a total of fifty teeth in all. The head is long, the muzzle pointed, and the ears are of large size, and naked. The feet are each provided with five toes furnished with claw-like nails, save the innermost toes of the hind-feet, which are destitute of nails, and these latter digits can be opposed to the other toes of the hinder extremities, so as to convert the feet into hand-like organs. The tail is elongated, generally destitute of hairs except at its base, and covered with scales. It is markedly prehensile, and in conjunction with the prehensile hind-feet, adapts these animals for leading an arboreal life. In some opossums the characteristic 'marsupium' or 'pouch'—from the presence of which the order derives its name, and which serves to protect the young for a considerable period after birth—is absent, and its place is represented by folds of the skin of the abdomen, amidst which the nipples are situated. The nipples open into the 'pouch' when that structure is developed. In one species of Opossum—the *Didelphys dorsigera*—the young are carried about on the back of the mother, and are securely retained in that position by entwining their tails around the parent's tail. In habits the opossums are generally nocturnal. The food consists chiefly of insects, the smaller mammals, and birds; whilst some species are fond of fruits; and the *D. cancrivora* obtains its specific name from its partiality for the flesh of crabs. They are pre-eminently arboreal animals, and frequently suspend themselves by the tail from the branches of trees, remaining in this position for hours at a time. The flesh of several species, of which the Virginian Opossum may be cited as an example, is eaten. On the ground the movements of the opossums are slow and awkward. They get the credit of being exceedingly cunning animals, and are said to show this cunning especially in counterfeiting death when caught or threatened with danger. 'Playing 'possum' has indeed on this account passed into a proverbial expression in America, to indicate any deceitful procedure. A recent observer declares, however, that this supposed counterfeit of death is solely due to fear. Opossums are generally hunted in the autumn months, after the first frosts appear. The fur is employed in the manufacture of various articles, but is not commercially used to any great extent. The nest is generally found in the hollows of trees. The female produces from ten to fifteen young. They may be domesticated when taken in the young state.

The Virginian Opossum is common in the United States. Its general colour is a whitish-gray, and the fur is of woolly-like softness; it is short on the face and body, but longer on the legs. This species averages a large cat in size. The *D. Opossum*, a typical species, is found in Guiana, whilst the Crab-eater (*D. cancrivora*) is common in Brazil. The curious Yapock (*Chironectes variegatus*), forming the type of a sub-genus of this family, found in Guiana and elsewhere, has the hind-feet webbed. It swims and dives with great ease, its food consisting of fishes, insects, and crustaceans. It inhabits holes in the banks of rivers, and possesses cheek-pouches for the reception of food. The *D. dorsigera* has already been referred to. The fossil representatives of the Opossum genus include the *Didelphys gypsorum*, the remains of which occur in the eocene tertiary formations; whilst rocks of miocene age afford the fossils of other species of this group. In Pl. CXXI.–CXXII. there are figures of the female with young of *Didelphys dorsigera*, and of the reproductive organs of that species. In fig. 7 *a a* is the ovary, *b b* the oviduct, *c c* the uterus, *d* mouths of the uteri, *e e* vagina, *f* urogenital canal *g* bladder, *h* urethra.

OPPELN, a town in Prussian Silesia, capital of the government of the same name, 53 miles south-east of Breslau, on the Breslau and Cracow Railway, and right bank of the Oder, here crossed by two bridges. It is walled, has several churches, a synagogue, gymnasium, a normal school, hospital, &c.; tobacco-factory, linen manufactures, cement and soap works, breweries, limekilns, and some shipping trade. Pop. in 1880, 14,447.—The government contains 5120 square miles, and 1,441,296 inhabitants. It is generally hilly and densely wooded, is drained chiefly by the Oder and partly by the Vistula, and has a cold, moist climate, and an indifferent soil. The minerals include argentiferous lead, iron, tin, alum, copperas, and coal.

OPPENHEIM, a town of Hesse-Darmstadt, in the province of Rhenish Hesse, on the left bank of the Rhine, 12 miles south of Mainz. It is situated on the steep slope of a hill abounding in vineyards, and carries on an active trade in wine. It occupies the site of the Roman castle of Bauconia, and was erected into a royal palatinate under the Carlovingians. It subsequently became one of the most important free towns in the empire. In 1218 it was taken by the Archbishop of Mainz, in 1620 by the Spaniards under Spinola, in 1631 by the Swedes under Gustavus Adolphus, and in 1634 by the Imperialists. In 1689 it was destroyed by the French, who left only one house, and the western side of the church of St. Catharine, standing. This church was partially restored in 1838–43. In the neighbourhood is an obelisk erected by Gustavus Adolphus to commemorate his passage over the Rhine. Pop. (1880), 3288.

OPPIAN, the author of two Greek poems still extant, entitled Halieutica (Fishing) and Cynegetica (Hunting). Modern critics have, however, come to the conclusion that these two poems were written by two different persons of the same name. 1. The author of the Halieutica was born at Corycus or at Anazarba, and flourished about 170 A.D. His poem consists of about 3500 lines, divided into five books. —2. The author of the Cynegetica was born at Apamea or Pella, in Syria, and flourished about 210 A.D. His work, which was dedicated to the Emperor Caracalla, is composed of four books containing 2100 hexameter lines. The best edition of the two poems is by Schneider (Strasburg, 1776, 8vo; second edition, 1813). There is also a prose paraphrase of a poem on Hawking, attributed to Oppian; but it is doubtful to which of the two it belongs.

OPPOSITION. A superior planet is in opposition when the earth is most nearly between it and the sun. A superior planet is 'in conjunction' when the sun is most nearly between it and the earth.

OPPOSITION, in politics, the party who, under a constitutional government, are opposed to the existing administration, and who would probably come into power on its displacement. A fair and temperate opposition is a wholesome check upon the party in power, as it is for its interest to demonstrate the injustice, impracticability, or insufficiency of the laws or proceedings of the government; but, on the other hand, the despatch of public business may be seriously delayed by the conduct of a factious or obstructive opposition. Under a despotic government opposition becomes rebellion. Although at an early period in English history rival political parties existed, yet a regular opposition, in the modern sense of the word, may be said to date from the accession of the house of Hanover.

OPTATIVE is the name given in grammar to that mood of the verb which is used to express *wish*, as is evident from its derivation from the Latin word *optare*. This particular form was originally common to all the Indo-European languages, but among cultivated languages it is now found only in the Greek and one or two others, its place being supplied by the subjunctive or auxiliary words, such as *may, will, can*, &c.

OPTIC AXIS, in a doubly refracting crystal, the direction to which, if a ray of light is parallel, it does not divide into two polarized rays. Crystals belonging to the pyramidal and rhombohedral systems have only one optic axis, and are called 'uniaxial.' This axis corresponds to the geometric axis of the crystal. Crystals belonging to the prismatic, oblique, and anorthic systems have two optic axes, and are called 'biaxial.' These axes do not usually correspond with any prominent lines in the crystal. The relative position of the two axes sometimes changes with the temperature and colour of the light. Glauberite possesses two axes at an angle of 5° for red light, and but one axis for violet rays. When in uniaxial crystals the extraordinary is greater than the ordinary index of refraction (see ORDINARY RAY and POLARIZED LIGHT), the optic axis of a uniaxial crystal is said to be 'positive;' when less, 'negative.' M. Fresnel pointed out that, as in biaxial crystals neither of the polarized rays into which a ray of common light divides obeys the well-known law of refraction, they must both be considered as extraordinary rays. The following tables are taken from Bird and Brookes' Nat. Phil.:—

UNIAXIAL CRYSTALS.

Positive.

Dioptase, Quartz, Zircon, Titanite, Apophyllite, Ice, Sulphate of Iron and Potash, Boracite.

Negative.

Calcite, Tourmaline, Sapphire, Emerald, Mica (some varieties), Cyanide of Mercury, Ferrocyanate of Potash, Phosphate of Magnesia and Ammonia.

BIAXIAL CRYSTALS.

Principal Axis Positive.

Sulphate of Nickel,	3° to 42°
Biborate of Soda,	28° 42′
Sulphate of Baryta,	37 42
Heulandite,	41 40
Soda-Sulphate of Magnesium,	46 49
Brazilian Topaz,	49° to 50°
Sulphate of Strontium,	50° 0
Sulphate of Lime,	60 0
Nitrate of Silver,	62 16
Scottish Topaz,	65 0
Sulphate of Potash,	67 0
Potash-Tartrate of Soda,	80 0

Principal Axis Negative.

Nitrate of Potash,	5° 20′
Carbonate of Strontium,	6 56
Talc,	7 24
Carbonate of Lead,	10 35
Mica (some varieties),	14 0
Sulphate of Magnesia,	37 24
Carbonate of Ammonia,	43 24
Sulphate of Zinc,	44 28
Sugar,	50 0
Phosphate of Soda,	55 20
Tartrate of Potash,	71 20
Tartaric Acid,	79 0

OPTICS is the science of vision. As a branch of mixed mathematics optics is founded on a few laws which have been proved by observation and experiment. (See LIGHT.) Experimental proofs of the numerous mathematical deductions from these simple laws are proofs of the truth of the original laws. It is to be remarked, however, that the laws of which we speak are not strictly true, and that the significance of their approximate truth is only to be learned from a study of the nature of light. See INTERFERENCE, UNDULATORY THEORY, POLARIZED LIGHT.

The ancients seem to have been very early ac-

quainted with metallic mirrors, and we find burning-glasses mentioned in the Comedy of the Clouds by Aristophanes, which was enacted during the fifth century before the Christian era. Pythagoras and Empedocles, who flourished in the same century, both speculated on the theory of vision; the former maintaining that objects become visible in consequence of particles from the luminous objects entering the pupil of the eye; the latter, on the other hand, asserted that objects become visible by means of particles emitted from the eye and striking them. It is not a little remarkable that Plato, who flourished about a century after, held the same opinion as Empedocles. The Platonic philosophers, however, taught two important laws in optics, that is, that light, from whatever source it may issue, is propagated in straight lines, and also that the angle of incidence is equal to the angle of reflection. Aristotle observed pretty accurately the phenomena of halos and the rainbow. Archimedes is said to have destroyed the Roman fleet by fire, concentrating the sun's rays by reflection from a great number of plane mirrors. The first writer on optics on record was Euclid, who flourished about the year 300 B.C. Seneca, about the middle of the first century of the Christian era, observed the effect of a glass bottle filled with water in magnifying objects, and also the effect of prisms in colouring objects seen through them. He also observed the magnifying power of concave mirrors. Claudius Ptolemy, the celebrated astronomer of Alexandria, was the greatest optician of the ancients. He lived about the middle of the second century, and two copies of his work still exist—one in the Bodleian Library at Oxford, the other in the Royal Library at Paris. In this work he treats of the theory of vision, or the refraction and reflection of light; of mirrors and lenses; and he treated the theory of astronomical refraction with more justice than any other astronomer before the time of Cassini. Nothing more was done by way of advancing optical science until the beginning of the tenth century, when Al Farabius, an Arabian, produced a work on Perspective; but the only Arabian optician whose work has come down to us was Alhazen, who lived about the end of the eleventh century. In his work he gives a very lucid account of the theory of vision, and a description of the eye; investigates the properties of seven different forms of mirror, and derives theorems for determining the relative distances of the object, image, and eye. In 1270 Vitello, a Pole, drew up an elaborate work on optics, in which he arranged the results of the labours of his predecessors in a methodical order, and added much that was new of his own. Roger Bacon, who lived during the greater part of the thirteenth century, treats largely of optics in his Opus Majus, where he clearly describes spectacles and the single microscope, and has by several historians been considered as the inventor of these, as well as the telescope. Muschenbroek states that it is inscribed on the tomb of Salvinus Armatus, a Florentine nobleman, who died in 1317, that he was the inventor of spectacles. Considerable additions were made to the science of optics by Maurolycus of Messina, who published a work in 1525 under the title of Theoremata de lumine et umbra, which contains many original and profound investigations on light. To the contemporary of Maurolycus, John Baptista Porta, we are in all likelihood indebted for the invention of the camera obscura, and some also claim for him the invention of the telescope, which last honour is also claimed for Roger Bacon, and for Thomas Digges by his son Leonard, who published a work entitled Pantometria (London, 1571), claiming with great plausibility the honour of the invention for his father.

The invention of the telescope is ascribed by Descartes to James Metius, a citizen of Alkmaer in Holland about the year 1600. Strong evidence has been given that telescopes were made in 1609 by Zaharius Jansen of Middleburg. Early in the seventeenth century M. A. de Dominis, archbishop of Spalatro, by a happy experiment with a glass globe, discovered the true theory of the rainbow, that it was produced by one reflection and two refractions in the rain-drops. Galileo, without any knowledge of the construction of the telescope of Jansen, formed one for himself at Padua in 1609, and constructed instruments of the form which generally goes by his name, that is, those composed of a convex object-glass and concave eye-glass, which had a magnifying power of 1000 times. The illustrious Kepler, in a work published in 1611, explained the theory of the telescope, and proposed the employment of one or more convex eye-glasses, a proposition which was first duly appreciated and put in practice by Father Sheiner; and Father Reitz effected a still farther improvement by employing an eye-piece composed of three or four convex lenses, and is in fact the inventor of the common refracting telescope. The doctrine of refraction was investigated by Kepler, and from his experiments he obtained many important results; he also discovered many of the theorems for the determination of the foci of lenses, and his reasonings on the theory of vision are remarkable in the history of optics for their profoundness and accuracy. From the striking facts elicited by the experiments of Kepler it is remarkable that the law of refraction escaped his penetrating mind; the honour of the discovery of this law was reserved for Professor Snellius of Leyden. To Descartes, who flourished during the first half of the seventeenth century, much is due for his contributions to optical science. Descartes showed that since the spherical form of lenses failed to concentrate the rays in one point, we must look for a perfect lens in one whose curve is one of the conic sections, and he therefore proposed the employment of hyperbolic and elliptical lenses in the construction of telescopes. Such lenses never have been formed, and it is more than likely never will; nor is it at all probable that the reflecting telescope has derived any advantage from the multifarious attempts that have been made to give the speculæ a parabolic form. The mechanical operations necessary to produce such curves seem utterly impracticable, and even if they could be produced in lenses, they would only destroy the caustic curve, but would not compensate for the far greater evil, the different refrangibility of the rays of light. To Descartes is due the honour of first explaining the true theory of the rainbow, and accounting satisfactorily for the formation of the double bow. About the same period, or a little later, a remarkable discovery was made by Erasmus Bartholinus, a Dane, who, having obtained some specimens of Iceland-spar, observed the remarkable phenomena of double refraction which they exhibit. In these crystals he remarked that a double image is formed, in one of which the light follows the ordinary law of refraction, while in the other it follows an extraordinary law. (An account of his experiments will be found in the 67th No. of the Philosophical Transactions.) His experiments were carefully repeated and extended by the illustrious Huygens, who had the honour of discovering the polarization of light. To the same philosopher is due the promulgation of the undulatory theory, which was afterwards embraced by Euler, Dr. Young, and most of the continental philosophers, and which has now obtained so much ground among men of science in this country as to have superseded and set aside the Newtonian theory of emission.

Huygens employed himself with success in the practical department of optics, and constructed telescopes some of which were 136 feet in length. James Gregory invented the reflecting telescope, which he describes in his Optica Promota, published in 1663 (see his life in Chambers' Biography); but he never lived to see his invention put into operation. This was soon followed by the reflecting telescopes of Newton and Cassegrain. Gregory discovered the law of refraction in the improved form in which we now have it, and made many very accurate experiments on the refractive power of different substances; so accurate, indeed, were those experiments, that his index for water is not more than $\frac{1}{1800}$th in error. In the year 1676 the Danish philosopher Roemur, from observations on the eclipses of Jupiter's satellites, made the important discovery of the motion of light, and proved that it travels over the diameter of the earth's orbit in about seventeen minutes. Several important contributions were about the same time made to optical science by Tschirnhausen and Petit, more particularly as regards the investigation of caustic curves and the structure of the eye. The greatest additions ever yet made to the science of optics were those contributed by the illustrious Newton. In 1664, when in the twenty-fourth year of his age, he commenced that brilliant series of experiments on colours which led him to the important discovery of the different refrangibility of the rays of light.

After the discoveries of Newton the next on record of any importance is that of the aberration of light by Dr. Bradley. Since the motion of light is such that it traverses the diameter of the earth's orbit in seventeen minutes, and that during that time the earth must have moved through a part of its orbit, it is plain that a ray of light from a celestial body will have reached the eye of the observer after the object and the observer have changed places, from the instant in which the ray was emitted from the object. This is what is called the aberration of light. The invention of the achromatic telescope has been claimed for Euler and Klingensticorus; but there can be no doubt that the invention is of British origin, and that it is due to Dollond, who died in 1761 at the age of fifty-five. Euler embraced the undulatory theory of Huygens, with this addition, that he supposed the differences of colour to depend upon the differences of the rapidity of vibrations. Clairaut investigated with great ability the theory of the achromatic telescope, in which he was followed with great success by d'Alembert, and also by the celebrated Boscovich. About 1760 Bouguer made numerous experiments with a view to ascertain the intensity of the light emitted by different objects, and the quantity of light lost by refraction and reflection, in which interesting inquiries he was followed by that ingenious German philosopher Lambert. Sir William Herschel commenced the construction of reflecting telescopes about the middle of last century, and erected them of greater dimensions than had ever been done before. In 1781 he constructed one of 30 feet in focal length of the great mirror, and in 1783 he began the construction of his great telescope of 40 feet, the diameter of the great speculum being 4 feet. Subsequent to this he investigated the solar prismatic spectrum, and made many important discoveries. About the year 1790 Dr. Blair made many valuable experiments with a view to determine the refractive and dispersive power of various substances, and proposed the employment of fluids in the construction of achromatic telescopes. About the same time Dr. Thomas Young began to labour in the advancement of optical science. He directed his attention to the mechanism of the eye, and the results of his observations are highly valuable. He invented the optometer, an instrument for ascertaining the quantity of defect in eyes either long or short sighted, and consequently for determining the exact remedy to be adopted in order to procure distinct vision. He also applied himself to the phenomena of colours and of the law of interference, which last, indeed, he discovered. Dr. Young adopted the undulatory theory, and applied it with the utmost perspicuity in the explanation of phenomena. Dr. Ritter of Jena was the first who directed his attention to the chemical action of the rays of the prismatic spectrum. Dr. Wollaston furnished a paper to the Transactions of the Royal Society in 1800, On Double Images formed by Atmospheric Refraction; and two years afterwards another exhibiting A Method of Examining Refractive and Dispersive Powers by Prismatic Reflection. It was the same philosopher who showed that the best form for the glasses of spectacles is the meniscus, with the concave side nearest the eye. He also invented the camera lucida (which see). Malus, shortly after his return from the Egyptian campaign, entered vigorously upon the study of optics, and discovered the polarization of light by reflection, a most important event in the history of experimental philosophy. He found that all bodies polarize light, but that this is a maximum at a certain angle, which is different in different bodies. The early death of Malus put a check to his brilliant career, and deprived the science of one of its brightest ornaments. His labours were, however, followed up by the researches of Arago, Biot, and Sir David Brewster. This last-mentioned philosopher, whose discoveries have enriched various departments of the science, directed his attention to the effect of heat and compression on polarization, and on the relation which the chemical composition of bodies bears to their optical properties. He also conducted many experiments with a view of determining the refractive powers of substances, and obtained many valuable results, particularly with regard to the gases. He invented several instruments, among which may be mentioned the kaleidoscope. We cannot farther extend this historical sketch, and merely mention the names of Fraunhofer, Berard, Morchini, Sir John Herschel, and Professor Stokes as those of men to whom optics is much indebted. We shall speak of the discoveries of Talbot, Fraunhofer, Kirchoff, Huggins, Lockyer, Angström, Bunsen, Father Secchi, Stokes, Frankland, Janssen, and others in the article Spectrum.

When all the minute parts of a surface give out rays of light in all directions we shall call it a luminous surface, whether it is self-luminous or is merely reflecting the light from a self-luminous body such as the sun. For the mathematical treatment of light phenomena it is sometimes necessary to speak of 'luminous points.' Any space or substance which light can traverse is in optics called 'a medium.' An assemblage of 'rays' proceeding from a luminous point is 'a pencil' of light. The shape of a pencil is conical, but when the luminous point is at a great distance from the comparatively small surface on which the rays fall the pencil becomes cylindrical, all the rays being approximately parallel to one another. Rays of light proceeding from a point are 'divergent.' Divergent rays are such as tend to get farther away from one another. Convergent rays are such as tend to get closer together whether they do or do not meet in a point. Parallel rays meet at an infinite distance. In these definitions we have assumed the fundamental law of light propagation in a homogeneous medium. Rays of light proceed in straight lines. We proceed to the other two laws on which the science of optics is founded. When a

ray of light meets the separating surface of two media a portion of it is reflected at this surface and does not enter the second medium; a portion enters the second medium and is refracted or caused to proceed in a direction different from that in which it proceeded in the first medium. It is impossible to get a single ray of light, that is, to get a pencil of light whose area of cross section is nothing; it is also impossible to get a natural surface perfectly smooth, that is, of a truly mathematical figure, plane or curved; but to simplify our investigations it is necessary to assume the following laws, which have been proved experimentally for very small pencils and very smooth surfaces:—1. *Law of Reflection.* When a ray of light is reflected at the surface of a medium the incident and reflected rays lie in one and the same plane with the normal to the surface at the point of incidence and on opposite sides of the normal; and the angles which the incident and reflected rays make with the normal are equal. 2. *Law of Refraction.* When a ray is refracted at the surface of a medium the incident and refracted rays lie in one and the same plane with the normal to the surface at the point of incidence and on opposite sides of the normal; and the sines of the angles which the incident and refracted rays make with the normal have a ratio which is constant for the media separated by the surface and for the same kind of light.

We shall first consider how the phenomena of images formed by mirrors are mathematical consequences of the law of reflection. A smooth regular surface does not scatter the light falling upon it but reflects all the rays in some definite way; such a surface is itself invisible when reflecting light, and may be called a mirror (which see). When a pencil of rays from a luminous point falls on a plane mirror each ray is reflected according to the law given above, and it is easy to show by geometry that the pencil which was divergent before incidence has exactly the same divergence after reflection; but the rays now seem to have proceeded from a point behind the mirror. This point is called the 'virtual image' of the first; the line joining the points is at right angles to and is bisected by the mirror. Now a luminous object is made up of points, each of which sends a divergent pencil to the mirror, which seems after reflection to proceed from a point behind the mirror, and hence a luminous object sends rays to a plane mirror which after reflection seem to have proceeded from a luminous object behind the mirror. This may be called the virtual image of the first, the object and its image being symmetrically situated with respect to the mirror. An eye receiving a ray (or a small pencil of rays) gets the impression that the luminous point from which it was sent is somewhere in the line of the ray just before reaching the eye, and hence an eye in such a position as to receive after reflection a few rays from every point of the object sees the image of the object. When two plane mirrors are given it is easy to apply the above principles to determine the images of any object formed by these mirrors. From every point of the object draw lines at right angles to the mirrors; find points on the perpendiculars as far behind the mirrors as the points of the object are in front; these points form the images of the object in the two mirrors. An image of the image in mirror A will be formed in mirror B; an image of this secondary image in B will be formed in A, and so on, and it would seem that an infinite number of images are produced. This is true when the mirrors are parallel, an object placed between parallel mirrors having an infinite number of images which are situated at greater and greater distances behind the mirrors. But when the mirrors form an angle with one another rays cannot become incident beyond their line of intersection, and as in practice their areas are limited in size, and as the position of the observer's eye imposes restrictions on the number of images seen, this number is in any particular case quite determinate. Thus if two plane mirrors meet at an angle δ, which is an exact submultiple of two right angles, the total number of images of a point placed between the mirrors is $\frac{360}{\delta} - 1$.

A well-known illustration is that of the three images (symmetrically arranged), formed by two plane mirrors at right angles to one another, of an object placed between them. (See also KALEIDOSCOPE.) It may be shown that if the direction of a ray before reflection remains the same whilst the mirror rotates through a given angle about an axis at right angles to the ray, the deviation produced in the reflected ray is twice the angle of rotation of the mirror. This principle is illustrated in the sextant (which see) of Hadley.

When a mirror is not plane the incident rays from a luminous point in general neither converge to a single point (a real image of the first) after reflection nor diverge as if they had come from a virtual image. But when a concave mirror is a portion of a paraboloid of revolution we find on investigation (applying the law of reflection to every ray) that rays from a luminous point in its geometrical focus become parallel to the axis of the paraboloid after reflection. We find too that if a concave mirror is a portion of an ellipsoid of revolution rays from one focus of the ellipsoid converge after reflection to the other focus. There is a similar law for a virtual image in the convex mirror which forms part of a hyperboloid of revolution. Of these particular cases that of the parabolic mirror is the only one of importance for practical purposes. But when the concave mirror is a small portion of a spherical surface it is found that all the rays falling upon it from a luminous point converge so nearly to a luminous point after reflection that their 'aberration' (as the non-convergence of the rays is called) may be neglected in practice. The line joining the centre of the spherical surface with the 'pole' of the mirror (that is, the middle point of the reflecting surface) is called the 'principal axis.' Any bundle of rays parallel to the principal axis converges after reflection to a point in the axis called the 'principal focus.' Any bundle of parallel rays converges after reflection to a focus which is at the same distance from the mirror as the principal focal distance. Such foci may be found experimentally by allowing the sun's light to fall on the mirror and by trial with a small white object finding the point of greatest concentration of the reflected rays. In such trials the amount of aberration may be noticed, for, strictly speaking, there is a region of concentration. By geometrically applying the law of reflection it is easy to show that the principal focal distance is half the radius of the spherical reflecting surface. In fig. 16, Pl. CXXXIX., ae is a ray parallel to the axis; ce is a normal to the surface at e, c being the centre of the surface. If the angle of incidence aec is equal to the angle ced, ed is the path of the reflected ray. If the mirror is only a small portion of the whole surface of a sphere it is found that all rays parallel to the axis meet after reflection nearly in the point d, where cd is half ce, the radius. Similarly it may be shown that any luminous point and its image lie in a straight line containing the centre of the spherical surface, and one on either side of the centre, unless the luminous point is nearer the mirror than the focus for parallel rays. In fact, if p_1 is the distance from the luminous

point to the mirror, p_2 that of its image, and if r is the radius of the spherical surface, then

$$\frac{1}{p_1} + \frac{1}{p_2} = \frac{2}{r} \text{ or } \frac{1}{f},$$

if f is the principal focal distance. As the law allows us to reverse the positions of the luminous point and its image, light proceeding from either of these points being reflected to the other, they have been called 'conjugate foci.' The same formula holds for a luminous point nearer the mirror than the principal focus if we regard distances measured behind the mirror as negative, for on applying geometrically the law of reflection we find that such a point has a virtual image, which is at a distance behind the mirror, satisfying the formula. This interpretation of positive and negative measurements is well known in mathematics. When we are concerned with a luminous object, and not merely a luminous point, the object is supposed to consist of an infinite number of such points, and when the images of the points are known the image of the object is known. As in the case of images formed in plane mirrors an eye in such a position as to receive after reflection a small pencil of rays from every point of the object sees the image of the object. It is to be remembered, however, that when rays reaching the eye are very divergent, as when the eye is very close to a mirror and is observing a virtual image whose position is very near, or indeed when the eye is very close to any object seen directly, no distinct image can form on the retina (see EYE), and hence the best position of the eye for viewing the image of a small object in a mirror of any kind is at the distance of distinct vision from the image (10 or 12 inches usually). In fig. 17 ab is an object; bcf, bef, and bdf are the paths of three rays from the point b forming an image of b at f; acg, adg, and aeg are three rays from the point a forming an image of a at g; in the same way the rays from every point of the object ab form an image of the point so that an image of the object ab is formed at gf. In the figure the image is smaller than the object, and is upside down. As the straight lines joining g and a and f and b pass through the centre, and as the distances of a point and its image from the mirror obey the law given above, the size of the image may be calculated when the size of the object is known, for from geometry we see that the size of the image is to the size of the object as the distance of the image from the centre of the mirror is to the distance of the object from the centre. The reader may prove by rough sketches that any real image formed in a mirror is inverted, and he will also find that any virtual image, whether in a concave or convex mirror, is erect. Real images of luminous objects may be thrown upon a screen, and hence if a lighted candle representing the luminous object is held at different distances from a concave mirror, and a screen be held so as to receive a well-defined image of the candle, the law

$$\frac{1}{p_1} + \frac{1}{p_2} = \frac{2}{r} \text{ or } \frac{1}{f}$$

may be roughly proved, and the law as to size and inversion observed. When the image is thrown on a screen every observer sees the same image; but this is not the case when the rays from the mirror are received directly in the eye; observers in different positions see different images. This is due to aberration, all the rays from the same point of the object not converging to a single point after reflection. If a semicircle representing the section of a reflecting hemispherical surface is drawn on paper, and if the paths after reflection of a bundle of parallel rays are drawn, it will be seen that they do not converge to a point; in fact they all touch a certain curve called a 'caustic curve.' Thus parallel rays after reflection from a concave mirror touch a caustic surface. A caustic curve is seen when bright light is reflected from the upper part of the inner side of a cup partly filled with milk. For an investigation of 'astigmatism,' or the non-convergence to a single point of a pencil of rays after reflection or refraction, including the discussion of caustics, 'focal lines,' 'circles of least confusion,' &c., we must refer readers to Parkinson's Optics.

The image of an object placed nearer a concave mirror than the principal focus is erect and larger than the object, and is virtual, so that it cannot be thrown upon a screen. The image of any object in a plane mirror is, as we have already seen, virtual, erect, and of the same size as the object. The image of any object in a convex mirror is also virtual and erect; it is, however, smaller than the object. By applying geometrical principles to reflection from a convex mirror it is easy to prove that a luminous point and its image lie in the same line through the centre of the reflecting spherical surface, and on the same side of this centre. The focus for parallel rays is virtual; it is called the principal focus, and is half the length of the radius behind the mirror. We can adapt the formula given above for the conjugate foci of a concave mirror to a convex mirror, if we employ the well-known mathematical convention that distances measured in front of the mirror are positive, and distances measured behind the mirror negative. Thus the radius and focal distance of a convex mirror must be regarded as negative. For example, a luminous point is 12 inches in front of a convex mirror, the radius of whose surface is 8 inches; where is the image? We know in the first place that the image is in a line joining the luminous point with the centre of the reflecting surface. We have also the formula—

$$\frac{1}{p_1} + \frac{1}{p_2} = \frac{2}{r},$$

which in this case becomes

$$\frac{1}{12} + \frac{1}{p_2} = -\frac{2}{8},$$

from which we find that $p_2 = -3$ inches; that is, the image is 3 inches behind the mirror.

Fig. 1, Pl. CXXXVIII., shows a vessel of circular section, half filled with water, the horizontal line through b representing a plane surface separating water and air. The ray of light $a\,b$ meets the water at b, where it bends to pass through the water in the direction $b\,c$. $g\,b\,h$ is a normal, that is, a line drawn at right angles to the separating surface; $a\,b\,g$ is the 'angle of incidence,' $c\,b\,h$ 'the angle of refraction.' In this case the ray has bent nearer the normal. If the ray had been passing in the direction $c\,b$ it would have bent at b away from the normal to pass through the air in the direction $b\,a$. As stated above, the law of refraction is that the sine of the angle of incidence is in a constant proportion to the sine of the angle of refraction. Thus the ray $a\,b$ passes through the water in the direction $b\,c$; the ray $e\,b$ passes in the direction $b\,d$, obeying the law—

$$\text{Sin. } a\,b\,g : \text{sin. } c\,b\,h = \text{sin. } e\,b\,g : \text{sin. } d\,b\,h = 1 : \mu,$$

where μ is a constant called the index of refraction for rays passing from air into water. In fact, sine of angle of incidence $= \mu \times$ sine of angle of refraction. It is to be remembered that if a ray of blue light follows the path $a\,b\,c$, a ray of red light will follow a slightly different path than $b\,c$ through the water, and that our law is true only when one sort of light is considered. This matter of the differing refrangibilities of different lights will be more fully entered

OPTICS.

Fig. 1.

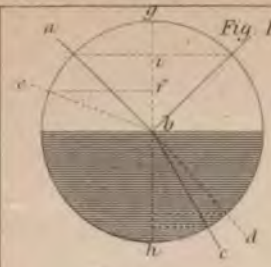


Fig. 2.

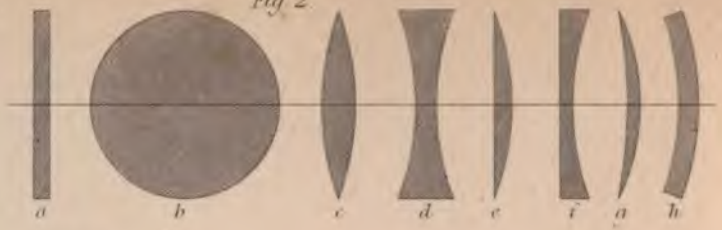


Fig. 3.

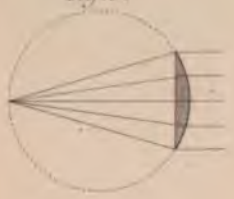


Fig. 4.

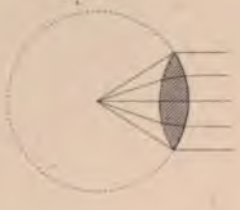


Fig. 5.

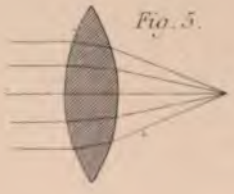


Fig. 6.

Fig. 7.

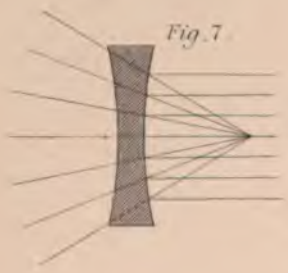


Fig. 8.

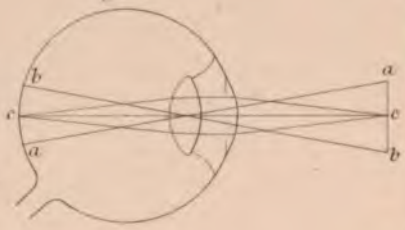
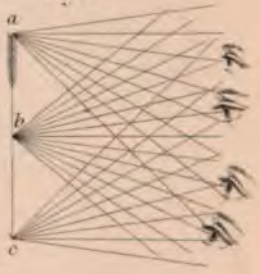


Fig. 9.



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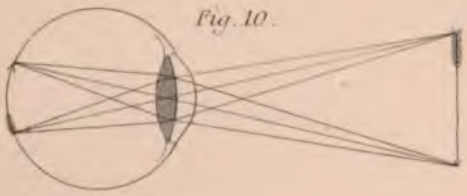

Fig. 11.

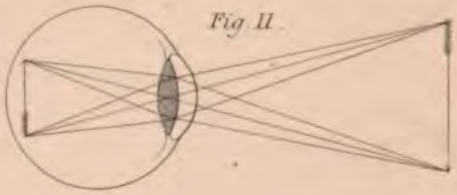

Fig. 12.

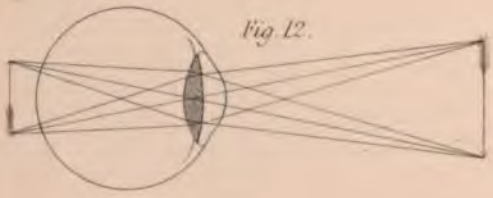

Fig. 13.

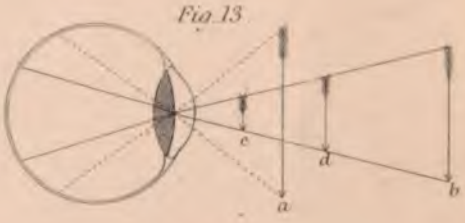

Fig. 14.

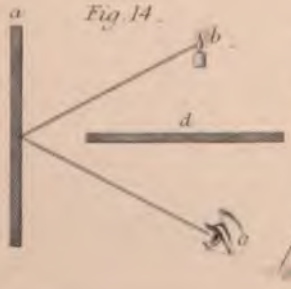

Fig. 15.

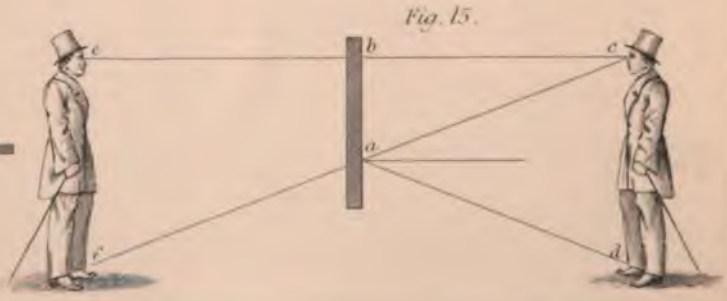

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Fig. 16.

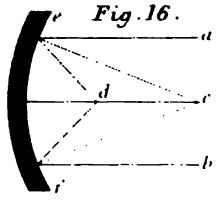
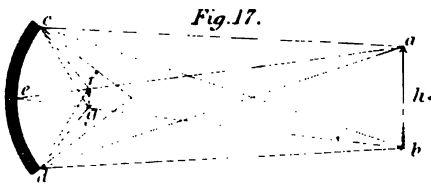


Fig. 17.



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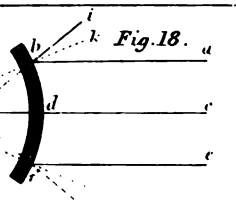

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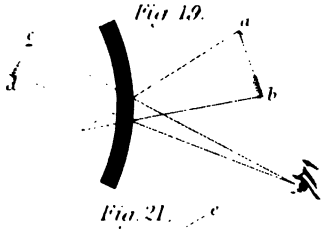


Fig. 20.

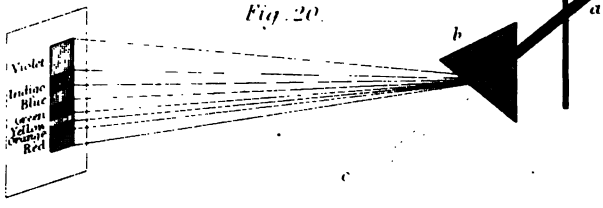
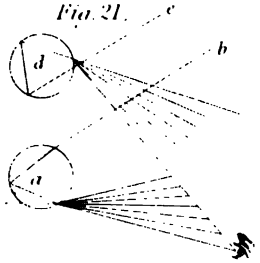


Fig. 21.



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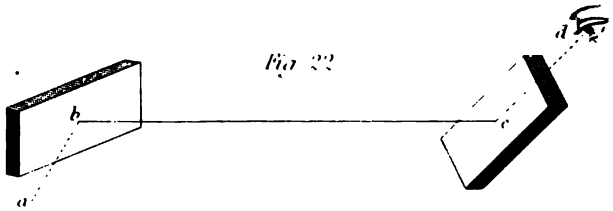

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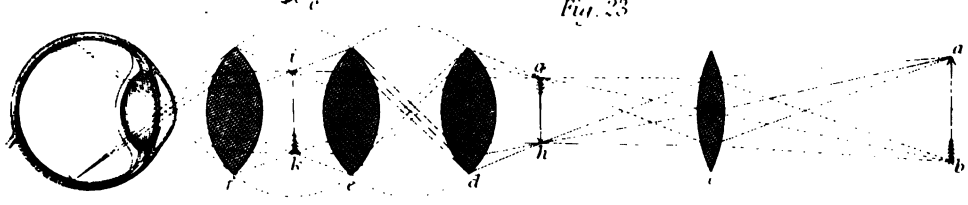

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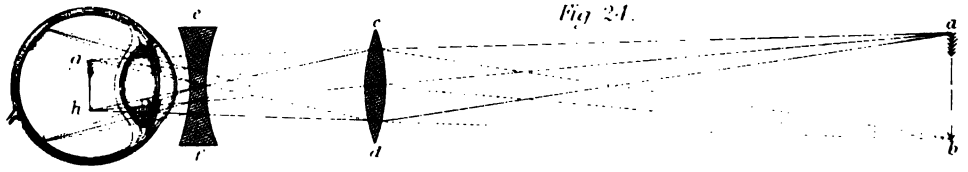

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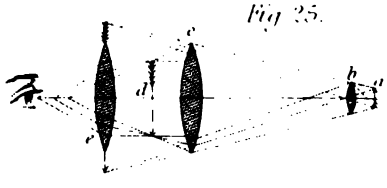


Fig. 26.

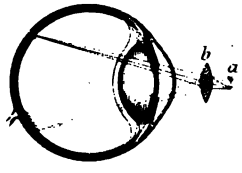


Fig. 27.

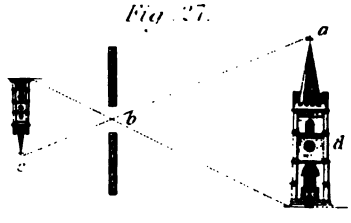


Fig. 28.

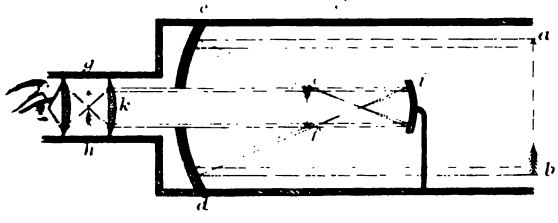
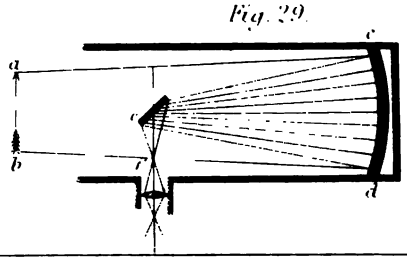


Fig. 29.



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into in the article SPECTRUM. In the meantime, when we give a numerical value for μ it is to be considered as the value for yellow light, which has a mean refrangibility. (See also INDEX OF REFRACTION.) μ, in the case of air and water, is 1·336; μ is always considered as the ratio of the sine of the greater to the sine of the smaller of the two angles made by the ray with the normal. It is usual in tables to give the index of refraction when a vacuum is one of the two media. It is easy to show that if μ_1 is the index of refraction for glass and a vacuum, μ_2 for air and a vacuum, then the index for rays from air to glass is equal to $\mu_1 \div \mu_2$. When the angle $a\,b\,h$ is so great that μ sin. $d\,b\,h = 1$ or $=$ sin. 90°, then $g\,b\,e$ becomes 90°, that is, $b\,e$ coincides with the surface, and hence a ray $d\,b$ when it emerges from the water passes along the surface. The angle $d\,b\,h$ is then called 'the critical angle,' because for a greater incidence than this the ray cannot emerge from the water, but is totally reflected at the point b. The critical angle, or 'angle of total reflection,' for air and water is therefore such that its sine is $\frac{1}{1{\cdot}336}$, and we find it to be 48° ½. For air and different kinds of glass its value is from 38° to 41°. If a glass of water with a spoon in it is held above the level of the eye, the underside of the surface shines like a brilliant mirror and the lower part of the spoon is seen by total reflection. (See also, in the article MIRAGE, Monge's explanation of that phenomenon.) A prism of glass whose section is a right-angled isosceles triangle, reflects totally at the face opposite the rectangular edge all rays entering either of the other faces nearly at right angles, and is used in certain telescopes instead of a plane mirror. Total reflection is the principle of the camera lucida (which see).

It is easy to see by a sketch that rays are not changed in direction after passing through a medium bounded by two parallel planes, although they are shifted parallel to themselves; and hence objects seen by oblique rays which have passed through such a plate (a plate of glass for instance) are not distorted in shape, although they are displaced from their true position. The student will find it a good exercise to draw the path of a ray of light incident on a plate of glass. Remembering that at any surface separating two media a ray is partly reflected and partly refracted (the amount of the light reflected being greater with greater angles of incidence), he will discover why a number of images of a candle are seen by reflection in such a plate.

If a luminous object is viewed through the angle of a prism of glass (see PRISM), the position of the object seems to be changed. This is due to the two refractions undergone by the rays, one on entering and the other on emerging from the glass. The whole change in the direction of a ray after passing through a prism may be called 'the angle of deviation.' The angle of deviation may be found when the index of refraction and 'the angle of the prism' (the angle between the face of the prism at which the ray enters and the face at which the ray emerges) are known. We find that the deviation is least when the ray makes the same angles with the faces of the prism on entrance and emergence; and if D is the angle of least deviation, A being the angle of the prism and μ the index of refraction, then

$$\mu = \frac{\text{sin. } \frac{1}{2}(\text{A} + \text{D})}{\text{sin. } \frac{1}{2}\text{A}},$$

a law of which great use is made in determining experimentally the indices of refraction of different substances.

A *lens* is usually a portion of glass bounded by two spherical surfaces, or by a spherical and a plane surface. In fig. 2, *c*, *d*, *e*, *f*, *g*, *h*, are sections of different forms of lenses. *c* is bounded by two convex surfaces, and is called a 'double-convex' lens; *d* has two concave surfaces, and is a 'double-concave' lens; *e* has a plane and a convex surface, it is 'plano-convex;' *f* is 'plano-concave,' *g* is 'concavo-convex,' and *h* is 'convexo-concave' (it is supposed to be thinner in the middle than at the edges, but the engraver has failed to convey this idea). Lenses thicker in the middle than at the edges are 'convex' lenses; the parallel solar rays after passing through a lens of this kind converge to a focus, called the principal focus. Lenses thinner in the middle than at the edges are 'concave;' they produce divergence of the solar rays, and their principal foci are therefore virtual. A line joining the centres of the spherical surfaces bounding the lens is called its 'axis.' The 'optical centre' of a lens is the point through which all rays must have passed whose directions on emergence are parallel to what they were before entrance. Such rays pass through the lens as through a plate of glass with parallel sides, so that if we join any two points at which two parallel planes touch the two curved surfaces, the place where this meets the axis is the optical centre. The focus for any bundle of parallel rays is evidently in the parallel line through the optical centre, and the focus for any pencil of rays from a luminous point is in the line joining the luminous point with the optical centre, being real or virtual as it is in this line or in the line produced. Tracing the paths of rays from a luminous point through a lens, by employing geometrically the law of refraction given above, we find that, in a double-convex lens, if μ is the index of refraction, r_1 and r_2 the radii of the surfaces, and if p_1 is the distance of the luminous point from the lens, the nearest curved surface being that whose radius is r_1, and if p_2 is the distance of the image of the luminous point on the other side of the lens, then

$$\frac{1}{p_1} + \frac{1}{p_2} = (\mu - 1)\left(\frac{1}{r_1} + \frac{1}{r_2}\right).$$

All the dimensions and directions given above being regarded as positive, if we change the shape of the lens in any way the same formula will hold, if care is taken to adopt the well-known mathematical convention with regard to signs; for instance, concave surfaces being regarded as having negative radii, &c. In making calculations it is often very necessary to know the principal focal distance, that is, the distance from the lens of the focus for parallel rays. This distance is regarded as positive in convex, and negative in concave lenses. When the focal distance is known the formula just given becomes very simple, and is easily remembered (compare with formula for mirrors given above). The luminous point and its image being regarded as on opposite sides of the lens at distances from it p_1 and p_2 respectively, and convex lenses being regarded as having a focal length of positive sign, that of a concave lens being negative, we have

$$\frac{1}{p_1} + \frac{1}{p_2} = \frac{1}{f},$$

where f is the principal focal distance. The formula applies both to cases of luminous points situated on the axis and others, care being taken that in every case p_1 and p_2 are measured on a line drawn through the optical centre. Knowing this law, it is easy to calculate the position and size of the image of any luminous object formed by a lens. Sometimes the image is real, sometimes virtual, but in every case it is seen by an eye if at the distance of distinct vision.

We assumed for simplicity that pencils of diverging and parallel rays were made to converge accu-

rately to a single point, or to diverge as if they had come from a point; but this is not really the case, for the rays really touch a caustic. This 'spherical aberration' of lenses renders images indefinite; it is partly diminished by employing an annular diaphragm to cut off all but the central rays. The defect may be remedied with less loss of light by combining two or more lenses. A lens is said to be equivalent to a combination of two or more when a small eccentric pencil (a single ray, as it is sometimes called) emerges from it at the same angle with the axis as when the same pencil emerges from the combination. The 'focal length of a combination' means the focal length of the equivalent single lens. Ramsden's eye-piece is a combination of two plano-convex lenses in which aberration is materially diminished. The convex surfaces are turned towards each other; the focal lengths of the two lenses are the same, and their distance asunder is two-thirds of the focal length of either. The focal length of the combination is three-fourths the focal length of either.

As stated in the article SPECTRUM, white light is a mixture of a great number of simple lights—for instance, solar light is a mixture of violet, indigo, blue, green, yellow, orange, and red lights. Now in passing from air to glass red light is not so much refracted as blue, and hence, when solar light passes through a convex lens, the focus for the blue is found to be nearer the lens than the focus for the red rays, so that the lens produces images of white objects which are more or less coloured. This 'chromatic aberration' is remedied by employing combinations of lenses of flint and crown glass. The 'negative' eye-piece of Huygens is found to afford a remedy, not only for chromatic aberration, but also for spherical aberration. It consists of two plano-convex lenses. The 'field-lens,' or that which is farthest from the eye, has three times the focal length of the eye-lens, and their distance apart is half the sum of their focal lengths. The focal length of the system is one-half the focal length of the field-lens. Readers will find it an instructive exercise to trace the paths of pencils of rays through the two combinations (Ramsden's and Huygens') which we have just described.

When a luminous object is in a known position relatively to a number of lenses and mirrors whose focal lengths and relative positions are known, it is easy by an algebraic application of the laws given above to find the size and position of the image formed by the arrangement. In the calculation due regard must be paid to positive and negative directions of measurement. Well-known exercises of this kind are the calculations of the magnifying powers of microscopes and telescopes, and the illuminating powers of telescopes, &c. See MAGNIFYING POWER, MICROSCOPE, TELESCOPE, SPECTROSCOPE, SPECTACLES, SOLAR MICROSCOPE.

[*Further Explanations of the Figs. on Pl. CXXXVIII. and CXXXIX.*—Fig. 3 is a plano-convex lens causing parallel rays to converge to a focus at a distance from its surface equal to the diameter of the sphere of which it forms a part. Fig. 4 is a double convex lens, with a power just double that of the preceding, causing parallel rays to converge at a distance from its surface equal to the radius of the circle from which it takes its convexity. Figs. 5 and 6 explain the action of the double convex lens on rays according as they fall on its surface in a state of divergence or convergence. In 6 the rays fall with a considerable convergence, and are rapidly brought to a focus. Fig. 7 shows the effect of a double concave lens, namely, to make divergent rays parallel, and parallel rays convergent. Fig. 8 shows how rays fall on the retina of the eye. (See EYE.) In Fig. 9 pencils of divergent light issue from the points *a*, *b*, and *c* in such a manner that an eye placed anywhere, as shown, shall receive a portion of every pencil, and hence shall be able to see the three points. Fig. 10 shows the section of a normal eye; fig. 11 shows the section of a short or near sighted eye, the lens being so powerful as to cause the rays to converge before they reach the retina; fig. 12 is an eye with the opposite defect, which would form an image behind the retina. Fig. 13 is an attempt to show how the eye judges of objects according to their distances. Fig. 14 is a simple illustration of the law of reflection; the image of the object *b* is distinctly seen at *c*, though the view of the object itself is intercepted by the partition *d*. Fig. 15 shows how a person may see his entire figure in a mirror of only half his height; the image is seen as at *e f* by the eye at *c*. The concave mirrors in figs. 16 and 17 are referred to in the article above. Fig. 18 shows parallel rays falling on a convex mirror, the action of which is exactly the reverse of that of the concave. The central ray *c d* is reflected in its original path, while the extreme ray *a b* is reflected in the direction *b i*, which direction is determined by drawing *h b k* from the centre of convexity, and making the angle *i b k* equal to the angle *a b k*; the line *i b* continued to *g* fixes the virtual focus of the mirror. Fig. 19 shows the magnitude and position of an image as produced by a convex mirror. The image is of the natural size only when the object is laid on the surface of the mirror, and diminishes the farther it is removed. Fig. 20 shows the action of a prism. (See PRISM and SPECTRUM.) Fig. 21 is intended to explain the formation of the rainbow (which see). Fig. 22 is an illustration of the polarization of light (see POLARIZED LIGHT). Fig. 23 is the ordinary refracting telescope; fig. 24 Galileo's telescope; fig. 25 the compound microscope; fig. 26 the simple microscope or magnifying-glass; fig. 27 illustrates the principle on which the camera obscura has been constructed; fig. 28 is the Gregorian reflecting telescope; fig. 29 the Newtonian reflector.]

OPTIMISM, that philosophical and religious opinion which maintains that this world, in spite of its apparent imperfections, is the best, and could not be otherwise than it is. Even the Stoics and Plotinus were of this opinion. This name, however, is chiefly given to the doctrine of Leibnitz, popularly illustrated by Pope—that God has, among the possible worlds which presented themselves to his understanding, chosen and created the best. Leibnitz developed this doctrine in his Theodicée, particularly with reference to the objections of Bayle on account of the evil in the world, and showed that what appears imperfect considered by itself is by no means imperfect considered with regard to the whole, and that the single parts are the best when considered in their connection with the whole. This philosophical doctrine was generally reduced to the dilemma—If this world were not the best, God either did not know a better one, or was unable or unwilling to create it—suppositions which impugn his omniscience, omnipotence, or perfect benevolence. Hence the inference was that this world must be considered the best. The doctrine is subjected to all Voltaire's peculiarly caustic irony in his novel of Candide.

OPUNTIA. See PRICKLY-PEAR.

OPUS OPERATUM (Latin, work wrought), a phrase employed by Catholic theologians to describe the manner of the supposed operation of the sacramental rites in the production of grace. It is intended to imply that the ministration of the rite (*opus*) is in itself, through the institution of Christ, an efficient cause of grace, and that although its operation is not infallible, but requires and presup-

poses certain dispositions on the part of the recipient, yet these dispositions do not of themselves produce the grace. Thus when the sacraments are administered to dying persons in a state of apparent unconsciousness, it is done in the hope that the dying person may be really disposed to receive the sacrament. It is by no means held that if these dispositions do not exist the sacrament will itself justify him. The regeneration of an infant is *ex opere operato;* the sacrament, by God's promise, being made effectual, there being no opposition on the part of the recipient, and the means of faith being impossible. Those who hold that the sacraments are merely adjuncts and assistants to the mind in its operations, that the mind, so assisted, makes an immediate approach to God, and receives immediately from him the grace which the sacrament denotes, deny the *opus operatum*, and make the whole work an *opus operantis*—that is, that the personal piety and fervour of the supplicant is the efficient cause of the grace imparted.

ORACLES, responses given by a deity or supernatural being to a worshipper or inquirer; also the places where the responses were uttered with certain prescribed ceremonies. There is not a sufficient stock of trustworthy information from antiquity to determine their origin or nature. The origin of the Egyptian oracles is dated at a period to which not even traditions, and much less historical monuments, extend. The oldest was that at Meroë; next, those at Thebes and Ammonium. In each of these places Zeus (or Jupiter) Ammon was the presiding deity. The oracle at Dodona, the oldest in Greece, was formed on the model of the last-mentioned, but appears to have united the Egyptian and Pelasgian character. The account given by Herodotus of the origin of the Pelasgian oracle would show that a colony from Africa attempted, by such an institution, to establish themselves in Greece. But a sacred tree in this place was, at an earlier period, oracular, and the rustling of its branches had been received as responses; consecrated women from Africa (prophetesses, the black doves of Herodotus) early dedicated this Pelasgian oracle to Zeus. According to Ritter, the oracle of Dodona (formerly Bodona) points to the service of Buddha. Of equal antiquity, perhaps, was the oracle in Bœotia, which first belonged to the Earth, then to Themis, and afterwards was transferred to Apollo. Still later was instituted the oracle at Delphi, which became the most important of all, partly from its favourable situation, and partly from its connection with the Council of the Amphictyons, at Pylæ. Besides, Zeus had an oracle at Elis, at Pisa, and in a subterranean cave in Crete; and Apollo at Delos, where the whispering of the trees gave responses, at Miletus, where a sacred fountain, at Claros, not far from Colophon, where a consecrated river inspired the priests, and many others. In addition to these the oracle of Trophonius, at Lebadea, in Bœotia, and that of Amphiaraus, at Oropus, on the borders of Attica and Bœotia, were in high reputation in Greece. Hera (Juno) had an oracle in the Corinthian territory; Heracles at Bura, in Achaia, where answers were given by throwing dice; Bacchus at Amphiclea, in Phocis, which returned answers in dreams, &c. Tzetzes mentions an oracle of Ulysses, and other heroes and prophets had theirs. The Romans had no domestic oracles, if we except the Albunea, the Cumæan Sibyl, the Sibylline books, the oracle of Faunus and of Fortuna at Prænestè (which belonged to the earliest times, and afterwards lost their reputation), but had recourse to those of Greece and Egypt. In the founding of cities and colonies, the introduction of new governments, the undertaking of important enterprises, both in war and peace, and particularly in all cases of great necessity, the oracles were consulted, and rich gifts presented to them; their priests needed great watchfulness and prudence not to expose themselves. Darkness and ambiguity in the responses was the common resource. Sometimes, however, there were obvious failures. But notwithstanding these, and notwithstanding well-known instances of corruption, they long maintained their standing, and sunk only with the freedom and independence of Greece. Under the reign of Theodosius the temples of the prophetic deities were shut up or demolished.

ORAN, a town in Algeria, capital of the province and on a bay of the same name, 209 miles W.S.W. of Algiers, on both sides of the Wad-el-Rahhi. It rises in the form of an amphitheatre on the side of Mount St. Croix or Mergiagio, is strongly fortified, and consists of two parts separated by a well-formed street lined with poplars. The principal buildings are a handsome parish church, formerly a mosque, another ancient church built by the Spaniards in the time of Charles V., a large modern hospital, an old castle, and an arsenal. It contains several foundries, tobacco manufactories, tanneries, breweries, &c. The principal articles of export are hides and skins, tallow, grain, tobacco, and raw sugar. The harbour, Mers-el-kebir, about 3 miles north of the town, owing partly to recent improvements, is large and commodious. Pop. 58,530, of whom about three-fourths are Europeans.—The province, forming a long belt along the Mediterranean, bounded on the east by the province of Algiers, south by the Sahara Desert, and west by Morocco, has an area, according to the official statement, of 33,245 square miles, but according to a planimetric calculation, based on Dr. Petermann's map of the Mediterranean, 80,683 square miles, and a population of 767,322, of whom about 150,000 are Europeans. The town was built by the Moors. It was captured by the Spaniards in 1509, by the Turks in 1708, and again by the Spaniards in 1732. It was destroyed by an earthquake in 1791, and shortly after abandoned by the Spaniards. In 1831 it came into the possession of the French, and has been developed by them into a large and prosperous town.

ORANG, the popular name of the 'Mias' or *Simia* (or *Pithecus*) *satyrus*, one of the anthropoid, higher, or man-like apes, included in the section Catarhina of the order Quadrumana (which see). Like other catarhine monkeys the Orang possesses oblique nostrils, which are set close together. The thumbs of both fore and hind feet can be opposed to the other digits, and the animal is thus purely 'quadrumanous,' or 'four-handed.' The thumb equals about a third of the length of the hand. As a whole the orangs are most man-like in the *form* of the hemispheres of the cerebrum or true brain, and in the number of ribs; but they differ widely from the human type in the extreme length of the arms, which extend to below the knee when the animal is in the erect position. The hind-legs are, on the contrary, short and stunted. The hips are covered with hair, the 'natal callosities,' or hard patches seen on the nates of many monkeys, being wanting in the Orang; whilst 'cheek-pouches,' in which food may be temporarily stowed, are also absent. The 'lateral ventricles' of the larynx are dilated to form 'air-sacs.' The nails of the fingers and toes are flattened. In height the male orangs, which are always taller than the female animals, average about 4 feet. The erect posture is assumed with difficulty, these animals progressing chiefly by swinging themselves along from tree to tree by the aid of their long arms. They rarely run, their gait on the ground being of an awkward and unsteady kind. The Orang is confined in its distribution within a limited area, being found

exclusively in Borneo and Sumatra. At birth the head of the Orang resembles that of the young child, and only after attaining definite proportions do the facial bones begin to project so as to form the 'muzzle,' and so to produce the characteristic type of features. The hair is of a brownish-red colour, the face being destitute of hair save at the sides. These apes evince a high degree of intelligence, and appear capable of being highly domesticated, especially if captured in the young state. See also MAN, APES, MONKEYS, QUADRUMANA.

ORANGE (*Citrus aurantium*, natural order Aurantiaceæ). The trees or shrubs of the Orange order are characterized by their producing alternate, compound, exstipulate, dotted leaves and fragrant flowers, and by their being filled with little transparent receptacles of volatile oil. The leaves of the common sweet orange are oblong-oval, acute, and articulated with the petiole, which is winged, thus having a jointed appearance by which the orange leaf is readily recognized. The flower exhibits a calyx with five divisions, a corolla with five imbricate petals, stamens equal in number to the petals or a multiple of them, and along with the petals inserted on a hypogynous disk, the filaments being united in several bundles; the fruit or hesperidium, with a separable rind not formed by the calyx, consisting of epicarp and mesocarp, and pulpy separable cells formed by the endocarp. The bitter orange, lemon, and citron have been longer known in Europe than the sweet orange, which is of comparatively recent introduction. Its native country is supposed to be China or the north of India; but the tree is now cultivated in almost every country where it finds a suitable climate, and this condition is particularly realized in Southern Europe. The orange is cultivated also in China, India, North and South Africa, Turkey, the Mediterranean Islands, South America, the Azores, and the West Indies. In Italy, Spain, and Portugal it forms a large proportion of the vegetation. There are many varieties of the sweet orange, the most remarkable being the St. Michael's, the blood red, the Maltese, and the Majorca or seedless orange. The bitter or Seville orange appears to have been cultivated by the Moors of Spain, probably to some extent for medicinal purposes; in Great Britain it is chiefly used in making marmalade, whilst the rind is employed as a tonic. The Tangerine orange is about the size of a walnut, the pulp has an agreeable flavour, and the rind is highly perfumed. The Bergamot orange yields the oil of that name, esteemed in perfumery, as also are the oils of orange flowers and orange leaves. See CITRON and LEMON.

ORANGE, an ancient principality in France, which, from the eleventh to the sixteenth century, had its own princes. Philibert of Châlons, the last prince, having died without issue in 1531, the principality passed, through his sister (who was married to the Count of Nassau), to the house of Nassau. It continued in this family till the death (1702) of William Henry of Nassau-Orange (William III. of England), when the succession became the subject of a long contest. The principal claimants were Frederick William I., King of Prussia (who claimed through his mother), and the Prince of Nassau-Dietz, stadtholder of Friesland (who claimed by the will of William III.) The King of Prussia, notwithstanding the protest of the other claimants, ceded the principality, by the Peace of Utrecht (1713), to France. The reigning dynasty of the Netherlands is of the house of Orange, and the heir-apparent bears the title of *Prince of Orange*. In November, 1830, the national congress of Belgium declared the house of Orange-Nassau to be for ever excluded from all power in Belgium.

ORANGE (Latin, *Arausio*), a town of France, in the department of Vaucluse, 13 miles north of Avignon. It has tolerably well-built houses; narrow and irregular streets, adorned with several fine fountains. Some magnificent Roman remains still exist, and attest the importance of the ancient Arausio. The principal are the theatre, of which the colossal wall that formed the scena, and the chord of the semicircle is still conspicuous for miles around, overtopping all the modern buildings in its neighbourhood; adjoining the theatre are some remnants of the circus or hippodrome, and near it is a triumphal arch. The manufactures consist of linen prints, napkins, and serge; and there are also silk and madder mills. The trade is in corn, wine, brandy, oil, silk, truffles, saffron, honey, wax, madder, &c. Pop. 10,301.

ORANGEMEN, a secret political society of Irish origin, composed exclusively of Protestants, and whose professed objects are to support and defend the reigning British sovereign, the Protestant religion, the laws of the country, the union of Great Britain and Ireland, and the succession to the throne in the present royal family so long as it remains Protestant. They associate also in honour of William III., prince of Orange, whose name they bear, as 'supporters of his glorious memory.' Every member must belong to a private or subordinate lodge, and can only be admitted on proof that he is over eighteen years of age, a Protestant, and of known loyalty. Any member marrying a Roman Catholic is expelled. Three or more subordinate lodges constitute a district lodge. Next above the district lodge is the county grand lodge, then the grand lodge, and finally the imperial grand lodge, at the head of which is the imperial grand-master, the chief and supreme head of the association. The society was founded in the north of Ireland in 1795, for the ostensible purpose of counteracting the Catholic secret societies known as Defenders or Ribbonmen. As nearly all the peasantry of the country belonged to one association or the other, and as feeling ran high, the northern counties were in a very unsettled state for a lengthened period. Whenever the opposite factions met in considerable force insults were exchanged, and riots attended with serious loss of life often ensued. The law was powerless against them, as witnesses were intimidated, and juries sometimes refused to convict offenders belonging to their own order. In 1828 and 1829 bloody conflicts took place in the counties of Clare, Armagh, and Fermanagh, in which considerable numbers were killed and wounded, and it was with some difficulty that the military succeeded in suppressing these disturbances. In 1834 it was discovered upon a parliamentary investigation that Orange lodges existed in thirty-four regiments of the army, and in the following year the Duke of Cumberland, afterwards King of Holland, who had been elected imperial grand-master, was compelled to dissolve the society in Ireland. It was revived in 1845, and has at present many thousands of members in Great Britain and Ireland, in the colonies, especially in Canada, and in the United States. The Catholic Emancipation Act of 1829, the repeal movement of 1848, the disestablishment of the Protestant Episcopal Church in Ireland in 1869, and the Fenian and Nationalist associations have all been warmly opposed by the Orangemen. Great demonstrations take place annually on the 12th of July, the anniversary of the Battle of the Boyne, and where the Catholic and Protestant parties are both in considerable strength, the processions of either party are the cause of serious disturbances, notwithstanding an act passed in restraint of party processions.

ORANGE RIVER, or GARIEP, a river in South Africa, forming part of the north boundary of Cape

Colony, and falling into the Atlantic, in lat. 28° 37′ S.; lon. 16° 18′ E. It is formed, in lat. 29° 6′ S.; lon. 27° 20′ E., by the junction of the Ky Gariep, or Vaal River, with the Nu Gariep, or Black or Cradock River; and flows in long sweeps south-west, north-west, and south-west, to its mouth in the Atlantic, where it is about 400 yards across; total course, about 650 miles. The Ky Gariep, or Vaal or Yellow River, rises in the Drakenberg or Quathlamba Mountains, west of Port Natal; flows with a great northern sweep, east to west, to its junction with the Nu Gariep, receiving numerous affluents in its course of above 400 miles. The Nu Gariep, or Black or Cradock River, rises in the same range of mountains, and near the same locality as the above river; and flows, with a long southern sweep east to west, to the junction with the Ky Gariep; total course, also about 400 miles.

ORANGE RIVER FREE STATE, a republic of South Africa, forming a sort of connecting link between Cape Colony, the Transvaal territory, and Natal; bounded on the west and north by the Vaal River, on the north-east and east by the Drakensberg Mountains, and on the south by the Orange River; area, about 41,500 square miles. It consists chiefly of vast undulating plains, dotted over, however, in many places with rocky hills, here called kopjies; in the northern parts hundreds of square miles are found with hardly a break in the horizon. The state is divided into seven districts: Bloemfontein (chief town, Bloemfontein, also the capital of the state), Winburg (chief town, Winburg), Smithfield (chief town, Smithfield), Harrismith (chief town, Harrismith), Fauresmith (chief town, Fauresmith), Philippolis (chief town, Philippolis), Bethulie (chief town, Heidelberg). Lying about 5000 feet above the sea level, the country is cold in winter, and in summer experiences violent thunderstorms, and long droughts often prevail. It is, however, very healthy, and favourable to European constitutions. The great main road from Cape Town to Port Natal passes in a circuitous manner through it. None of the rivers are available for internal communication, owing to the frequent occurrence of shallows, rapids, &c. Immense herds of large antelopes formerly roamed over the vast plains, but they are now fast disappearing, their place being occupied by more valuable herds of horned cattle and wool-bearing sheep. Diamonds, garnets, and other precious stones, the former in considerable and paying quantities, have recently been found on the Vaal River and elsewhere within the territory, and it is supposed that it abounds with other valuable mineral products. Before 1836 this region was a howling wilderness, inhabited by hordes of bushmen and broken tribes of Bechuana and Zulu refugees from the armies of the Zulu tyrants Chaka, Dingaan, and Moselikatse. After the Kaffir war of 1835–36 many of the Dutch boers of the north-east frontier of Cape Colony became discontented with the government under which they were living, and an extensive emigration took place, many of the emigrants intending to settle in Natal. On this territory being declared an English colony, however, in 1843, the boers retired to the country north of the Orange River, and declared their independence of the British government. After some opposition, and one or two conflicts with our troops, the country was annexed to the British Empire, and continued so until 1854, when it was formally given up to the inhabitants, who were left to form any sort of government they pleased. The executive is intrusted to a president elected by the landdrost and heemraden in the several districts; while the volksraad or people's council exercises legislative functions. The boers profess the Dutch Reformed faith, and speak a Dutch dialect, intermingled with Hottentot and English words. Pop. in 1880, 61,022 whites, and 72,496 coloured; total, 133,518.

ORATORIO (Italian, *oratorio*, a small chapel, the place where these compositions were first performed), a sacred musical composition consisting of airs, recitatives, duets, trios, quartetts, choruses, &c., with full orchestral and sometimes organ accompaniment, and opened with an instrumental overture. The subject is generally taken from Scripture, and the text is often in a dramatic form, as in Handel's Samson; it sometimes takes the form of a narrative, as in Israel in Egypt; at times it is of a mixed character, as in Haydn's Creation, and sometimes it consists merely of detached pieces of Scripture, as in the Messiah. The oratorio was derived from the mystery or religious drama of the middle ages, of which it presents a modified form, adapted to the services of the church. Its origin has been usually ascribed to St. Filippo de Neri, who, in 1540, founded the congregation of the Oratory in Rome, one of the objects of which was to deter the young from profane amusements by rendering religious services as attractive as possible. For this purpose they began by the introduction of canticles, spiritual songs, and choruses, and subsequently to increase the attraction. Scriptural songs and incidents were formed into dramatic poems, written in dialogue and set to music by the best contemporary composers. The subjects were Job and his Friends, the Prodigal Son, the Angel Gabriel with the Virgin, and the Mystery of the Incarnation. These productions were recited and sung, with instrumental accompaniments, before and after the sermon. Stradella was one of the first of those who became celebrated for this exalted kind of composition; his oratorio of San Giovanni Battista, produced in 1670, is analyzed and highly praised by Dr. Burney. The increasing popularity of the oratorio at length induced poets of eminence to supply texts for them. Apostolo Zeno and Metastasio wrote a number of oratorios, or as they were then called *azioni sacre*, many of which were set to music by Caldara; one by the latter poet, La Passione, was reset by Jomelli, and is considered one of this composer's best works. The Passions-Musik of Sebastian Bach was a kind of oratorio, originally performed during church service, the congregation joining in the chorales. The oratorio was introduced into England in 1720, when Handel set Esther (Racine's tragedy adapted by Humphreys) for the chapel of the Duke of Chandos. It was performed by the children of the Chapel Royal in 1731, and in 1732 was publicly produced, as appears from the following advertisement in the Daily Journal:—'By his Majesty's command, at the King's Theatre, in the Haymarket, on Tuesday the 2d of May, will be performed the sacred story of Esther, an oratorio in English, formerly composed by Mr. Handel, and now revived by him with several additions, and to be performed by a great number of voices and instruments. *N.B.*—There will be no acting on the stage, but the house will be fitted up in a decent manner for the audience.' This was followed by Deborah in 1733; by Athaliah in 1734; Saul, and Israel in Egypt in 1738; The Messiah, 1741; Samson, 1742; Judas Maccabæus, 1746; Joshua, 1747; Solomon, 1749; and Jephtha in 1751. The most notable productions in this department of music that have since appeared are the Creation, by Haydn (1798); the Mount of Olives, by Beethoven (1803); the Last Judgment, by Spohr (1825); Saint Paul (1836) and Elijah (1846), by Mendelssohn, Handel's sole rival in this field. Among the oratorios by living composers may be mentioned Eli, and Naaman, by Sir Michael Costa; John the Baptist, The Resurrection,

Joseph, and David, by Sir G. Macfarren; and The Light of the World, and The Prodigal Son, by Sir Arthur Sullivan. At Exeter Hall, London, and at the musical festivals throughout England, oratorios are performed on a large scale, and with a power, precision, and perfection unknown elsewhere. At the triennial festivals in the Crystal Palace the band and chorus amount on an average to nearly 4000 performers. In America and Germany the oratorio has long been popular, almost as popular as in England.

ORATORY, an apartment in a private house or building designed for domestic worship. It differs from a chapel inasmuch as it contains no altar, nor may mass be performed in it.

ORATORY, PRIESTS OF THE, a religious order founded by St. Filippo de Neri in 1570, for the study of theology, and for superintending the religious exercises of the devout. The members live in community, and are not bound by the monastic vows. They are at liberty to withdraw at any time, and to resume possession of the property they may have brought with them at entrance; during association each member manages his own financial concerns, and pays a fixed sum towards the common expenses of the community. Societies of this nature were soon formed all over Italy and the Low Countries, but without any mutual connection, and such now exist in England, France, and elsewhere.

ORCADES. See ORKNEY ISLANDS.

ORCHARD, an inclosure devoted to the culture of fruit-trees, and in which these are planted as close to each other as their profitable cultivation will admit. The introduction of kitchen vegetables to any considerable extent among the trees of the orchard exhausts the soil, and should be avoided. The most productive orchards are generally such as are situated on declivities open to the south or south-west and sheltered from the north, north-east, and west. For an orchard of apple-trees a deep, unctuous soil should be selected; a low situation should be avoided, for not only is the blossom liable to be injured by spring frost, where damp and fog prevail, but the trees themselves become mossy and perish from excess of moisture. The best authorities recommend an early and effectual preparation of the soil and the early transplanting of the trees. If a dry spring succeeds the autumn of their planting they will require to be watered and their roots occasionally dug round and manured. When skilfully performed pruning is advantageous to young trees, as branches should not be crowded together, especially near the centre of the tree; but it is seldom beneficial to old trees except for the removal of misletoe. The amputation of large limbs leaves wounds which injure the sap-wood by exposing it to the atmosphere, and produces canker in the stem or principal branches. For pear-trees a lighter soil is desirable; and the same rules may be observed for their planting and preservation. The surface of the soil, in the case of orchards situated on declivities, is generally kept under pasture, which, while it prevents the earth from being wasted away by rains, is favourable to the running of the roots immediately under the surface, by which they are called sooner into action by heat in spring and sooner thrown into a torpid state by cold in autumn. The fruit chiefly grown in English orchards are the apple, the pear, the plum, and the cherry; but walnuts, chestnuts, medlars, mulberries, quinces, and in the most southern parts figs and peaches, are grown. The principal apple and pear orchards are in the counties of Devon, Somerset, Gloucester, Hereford, and Worcester; the cherry orchards are in Buckingham and Kent. The districts of Clydesdale (Lanarkshire) and the Carse of Gowrie (Perthshire) are the only places where orchards are cultivated to any important extent in Scotland.

ORCHARD-HOUSE, a glass-roofed shed designed for the cultivation of fruits of finer kinds or in greater perfection than can be grown in the open air. It is the invention of Mr. Rivers of London, and is generally a low structure; for a width of 12 feet it is only about 7 feet high at the back, and only 2½ feet at the front, so that the fruit and foliage are very near the sloping glazed roof. The trees, which are planted in pots, are never allowed to grow to a considerable size, being so trained and pruned as to have the greatest amount of fruitful wood within the smallest space. The pots have a large hole in the bottom through which the smaller roots may pass, and are placed upon a border chiefly made up of loose and open materials, as lime-rubbish, cinders, broken bricks, &c., with manure added. The roots are cut through at the bottom of the pot after the fruit is gathered, and the trees then rest during winter. They are ready to undergo the same process next year.

ORCHESTRA, the space in theatres between the seats occupied by the spectators and the stage, appropriated by the Greeks to the chorus and the musicians, by the Romans to the senators, and in our modern theatres to the musicians; the name is also used for the part of concert-rooms assigned to the vocal and instrumental performers; and, lastly, is applied to the instrumental performers, collectively taken, in any musical or dramatic entertainment. The earliest example of the composition of an orchestra is afforded by Monteverdi's opera of Orfeo, performed in 1604, in which twenty stringed and twelve wind instruments were employed chiefly to accompany the voice, although they were not all played at the same time. Later on the stringed instruments were increased to the almost total exclusion of the other kinds, and the works of Carissimi and Lully were written chiefly for violins, violas, violoncellos, and double-basses. Gluck was among the first composers who showed that stringed and wind (brass and wood) instruments could be effectively combined; but it was not until after the time of Haydn's later works that the wind instruments came to be regarded as an indispensable of the orchestra. A modern orchestra consists of stringed, wind, and percussion instruments. The stringed instruments should greatly outnumber the wind instruments, and those latter the instruments of percussion. For a grand orchestra the following proportions have been recommended: Twelve first and twelve second violins, eight altos, ten violoncellos, eight double-basses; two flutes, two oboes, two clarionets, two bassoons, four horns, two trumpets, two cornets à piston, three trombones, one ophicleide; one big drum, two small drums, cymbals, one triangle—that is, fifty string, twenty wind, and five percussion instruments, amounting to seventy-five in all. To these is added for the performance of oratorios an organ of first-rate power. A very effective small orchestra for a moderately sized concert-room may be made up of the following proportions: Six first violins, five second, three altos, two violoncellos, two double-basses; two flutes, two oboes, one clarionet, one bassoon, one cornet, one trombone, two horns; and one kettle-drum—twenty-nine instruments in all. The trombone may be left out without sensibly lessening the efficiency. By far the greatest part of the work falls to the share of the stringed instruments, the parts for which form a complete quartett (for first and second violin, alto, and violoncello), which should be complete in itself. The double-bass is employed to strengthen the violoncello part. This quartett is occasionally interrupted by passages in two or three parts, unisons, or octaves, or solos by the leading instruments. To produce certain effects the strings

may be silent for some time, letting the wind-instruments (the wood or brass, or both combined) be heard alone.

The orchestral seats of a concert-hall should be so arranged that the front is about 5 feet above the level of the room, and it should rise rather abruptly to the back, the corners of which ought to be rounded off so that the body of sound may be directly reflected. Previous to the beginning of the eighteenth century the instrumentalists of our theatres were stationed in a box at the side of the stage; they were then few in number. However desirable it might be in some respects that the orchestra should be concealed from the spectators and placed also in a better position for musical effect than at present on a horizontal plane between part of the audience and the stage, it is difficult to assign a better.

ORCHIDACEÆ, or ORCHIDS, an extensive order of endogens, consisting of herbaceous plants or shrubs, with fibrous or tuberous roots; a short stem or a pseudobulb; entire, often sheathing leaves; and showy flowers, with a perianth of six segments in two rows, mostly coloured, one, the lowest, generally differing in form from the rest, and often spiral. By adhesion or abortion the parts of the perianth are sometimes reduced to five or three. Essential organs united on a common column or gynostemium. Stamens three, the two outer, sometimes the central one, being abortive; anthers two-, four-, and eight-celled; pollen powdery, or adhering in masses, attached to the rostellum by a naked or saccate gland. The species of cold and temperate climates are all perennial and devoid of stems; those of the equatorial regions live only as parasites on living or dead vegetables or are sarmentose and climbing shrubs. It is above all in the great virgin forests of South America and of the East Indies that the orchids abound. There they form conspicuous objects as well from the singularity as from the elegance of their form. Botanists are far from being acquainted with all the species belonging to the order. Their number diminishes from the tropics towards the poles. About 100 are known in the Mediterranean region of the old continent; Central Europe possesses only fifty; Northern Europe and Asia about forty; and the Polar zone only five. Owing to the peculiar conformation of the labellum and irregularities in the shape, size, and direction of the sepals and petals, the flowers formed often assume the strangest and most grotesque appearance, looking much more like denizens of the animal than of the vegetable kingdom, and hence there is scarcely a common reptile or insect to which some of them have not been likened. Thus among British native plants we meet with such names as the bee, the fly, the butterfly, the lizard, and the man orchis; and among foreign plants we have, not to mention others, the *spirito santo*, or Holy Ghost plant of Panama, so called because in the flower a likeness can be traced to a dove in the act of descending upon the lip; and the swan plant, whose general shape and wings are almost exactly represented by the body of the plant, while the arched column bears a singular resemblance to its head and neck. The orchids attract much attention, and are cultivated with zeal on account of their curious shapes, gay colours, and not unfrequently fragrant smells, but few of them possess any economical value. The nutritive substance called salep is prepared from the roots and tubers of several species; the fragrant vanilla, obtained from two species of a genus of that name, is used in the manufacture of chocolate, liqueurs, and various articles of confectionery; in the starchy roots of many the natives of Australia find a tolerable food; and in Brazil the viscid juice contained in the calasetums, cyrtopodiums, &c., when inspissated by boiling, is used as a glue.

ORCHIL. See ARCHIL.

ORCHIS. See ORCHIDACEÆ.

ORCIN, a soluble crystalline substance, having the formula $C_7H_8O_2$, obtained from lichens. From this substance a number of bromine substitution products are prepared, and also a series of homologues.

ORCUS, the same as *Hades* or *Pluto;* thence also the *kingdom of Pluto* (the infernal regions). See PLUTO and TARTARUS.

ORDEAL. It was formerly believed by almost all nations that when proofs of right or wrong, innocence or guilt, were wanting, the God of truth and justice would himself interpose and make known the truth by a miracle. In accordance with this opinion a person suspected of any crime was made to perform solemnly before the priests certain acts which would in the natural course of things be injurious to him; and if he escaped unhurt he was declared to be innocent. These processes were called *ordeals* or *judgments of God*, and were in use particularly among the Germans. They are mentioned also in the ancient sacred writings of the Hindus. As success or failure, except in a few cases, depended on those who made the requisite preparations, a wide field was opened to deceit and malice, especially of the priest.

The following ordeals were in use in Germany and England:—The judicial duel, in which the conquered was viewed as guilty; the ordeal of fire; the ordeal of water; the corsned; the trial of the eucharist; the judgment of the cross; and the trial of the bier. In criminal cases, where the perpetrators of the deed could not be discovered, these ordeals were applied; some of them even in civil cases, so that the defendant could free himself in this way from claims or charges not sufficiently substantiated. Even among the ancient Celts children whose mothers were suspected of adultery were placed in a shield on the Rhine, and if they sank it was inferred that the suspicion was correct. The Salian Franks at the beginning of the fifth century used the ordeal of hot water, and the ordeal of cold water was introduced afterwards. After the introduction of Christianity the use of ordeals soon became general, for the oath of purgation was but little if at all known, and by means of ordeals an opportunity was given to the clergy to subject legal trials of every kind to their own decisions and thus to increase their authority. The ordeal of fire was as follows:—The accused was compelled to walk barefooted over glowing coals, or over nine red-hot ploughshares, or to carry a red-hot iron in his naked hand a considerable distance; or else glowing coals were laid upon his feet, or he was made to walk through fire: in the last trial the accused was often dressed in a robe covered with wax (the trial of the waxen shirt); if he was unhurt by the fire it was regarded as a proof of his innocence. In other cases a priest put the corsned, or hallowed morsel, into the mouth of the accused, with various imprecations. If the accused swallowed it instantly and felt no sensation of sickness or pain he was freed from punishment. The trial of the eucharist was used chiefly among the clergy and monks. They took the sacrament in attestation of their innocence, and it was believed that God would immediately smite the guilty with sickness or death. The trial of the cross was of two kinds. Both the accuser and the accused were placed under the cross with their arms extended or crosswise, and the one was condemned who first moved his hands or suffered them to fall; or else the supposed criminal was conducted into a church or placed before relics. Two dice were then produced, one of which was previously marked with a cross. Of these one was taken up at hazard. If it happened to be the die having the sign of the cross the accused

was exempted from punishment. Finally, and indeed from the earliest times, the trial of the bier was used in the crime of murder, that is, the murdered person was placed upon a bier and the supposed perpetrator made to touch the body, especially the wounds. If blood flowed out, or foam appeared at the mouth, or the dead body altered its position, the suspected person was considered guilty. Sometimes, instead of the whole body, only the hand was taken. Superstition and artifice gave to these absurd ceremonies the highest authority; and even the prohibitions of enlightened emperors were insufficient to abolish them. The Papal chair had more influence in restraining them by frequent denunciations and by the introduction of an improved judicial system. Indeed many rulers and magistrates saw their absurdity. Hence after the fourteenth century ordeals became more uncommon, and in the fifteenth they were wholly put down by the increasing use of the canon law, which invented new means for the removal of suspicion, especially the oath of purgation, and still more by the universal use of the Roman law. In the sixteenth century only the trial of the bier was used, and this continued even into the first part of the eighteenth. In consequence of the still prevalent belief in sorcery the ordeal by cold water was also retained in the trials of witches. The supposed witches were placed in the water, and if they floated they were declared guilty. Besides this ordeal (found in Prussia in the seventeenth century and in the neighbouring countries in the first half of the eighteenth), there was also the weighing of witches; they were weighed, and if they were found to be uncommonly light they were pronounced guilty. These foolish customs were gradually done away, when Thomasius succeeded in almost wholly annihilating the belief in witches. It deserves to be mentioned as a singular circumstance that as lately as 1728 several witches were weighed at Szegedin in Hungary. With the exception of these few relics of ordeals the end of the fifteenth and the beginning of the sixteenth century are to be regarded as the closing period of them in Europe. But it is to be lamented that the Roman law substituted in their place an equally horrid process in criminal cases, namely, the torture, which was originally applied only to slaves, but afterwards to freemen also. Ordeals are still found in many nations out of Europe. We learn from Dr. Livingstone that the practice of ordeal is common among all the negro nations north of the Zambesi. When a man suspects that any of his wives have bewitched him he sends for the witch doctor, and all the wives go forth into the field and remain fasting till that person has made an infusion of the plant called *goho*. They all drink it, each one holding up her hand to heaven in attestation of her innocency. Those who vomit it are considered innocent, while those whom it purges are pronounced guilty and put to death by burning. Some negroes on the coast of Guinea put into the hands of the accused herbs and barks of a peculiar character and suppose they have the property of burning the guilty. The natives of Pegu and Siam have the ordeal of cold water. The Tchuvasses and Ostiaks in Russia in Asia connect the trial of the consecrated morsel with an oath. The Chinese have the ordeals by fire and water; but the chief ordeals are among the Hindus, in Congo, and in other places.

ORDER. In zoology the name 'order' is applied to those divisions into which a 'class' of animals is subdivided. Thus the great *class* Mammalia—including those vertebrate animals which possess two 'occipital condyles,' which nourish their young by means of the milk-secretion of the mammary glands, which possess non-nucleated red blood-corpuscles, and whose bodies are covered with hair—is divided into a number of 'orders,' each of which, whilst agreeing in the characters common to the whole class, yet include a number of animals which are allied to each other by some very special feature or features in their economy. The 'order,' in fact, embodies the characters of the class, with one or more of these characters highly individualized. The order of Rodentia, or 'Gnawing' Quadrupeds, is thus distinguished as including those mammals in which canine teeth are wholly wanting, and in which the incisor or front teeth never number more than two in the lower jaw, and rarely more than two in the upper; whilst these latter teeth grow from permanent pulps, and exhibit a peculiar arrangement of the tooth-substance, admirably fitting them for their 'gnawing' operations. Under this order are included a great variety of different forms—squirrels, beavers, porcupines, rats, rabbits, &c. &c.—linked together by these characteristics in their dental arrangement. Similarly, and by special characters of their own, the orders of the Quadrumana or Monkeys, the Ungulate or Hoofed Mammals, the Marsupial Mammalia, and the other divisions of the class, are defined and separated. The 'class' of Birds, by the structure and disposition of the toes and beak, is divided into orders. Thus the Natatores, or Swimming Birds, constitute an order known by their webbed feet and by other characters; and the order of Wading-birds, or Grallatores, is known by the elongated legs united to other points of distinction. The 'order' itself is divided into subordinate groups named 'genera,' each of which is termed a 'genus.' And conversely an order might be described as constituted by a number of genera closely resembling one another in several important features of their economy. In botanical classification the same essential ideas guide the formation of genera, orders, and classes.

ORDERICUS VITALIS, a historian of the twelfth century, of a French family, but born at Atcham or Attingham, near Shrewsbury, England, in 1075. At the age of ten years he was sent for education to an abbey in Normandy. He entered into the order of priesthood, but devoted his life to literary studies. He died after 1143. He wrote an Ecclesiastical History in thirteen books, published in Duchesne's Historiæ Normannicæ Scriptores (1619), and in other collections. It is a chronicle of events from the birth of Christ down to his own time. The earlier books are full of inaccuracies and fabulous narrative, but the last half of the work, which treats of his own times, is most valuable to the English and French historical student.

ORDERLIES, in the British army, are privates and non-commissioned officers appointed to attend upon general and other commanding officers, for the purpose of bearing their orders and rendering other services. The orderly officer, or officer of the day, is the officer of a corps or regiment, whose duty is to superintend its interior economy, as cleanliness, quality of the food, &c. Orderly non-commissioned officers are the sergeants of each company, appointed weekly, to take down the general or regimental orders affecting their respective companies, show them to the company officers, and have in readiness the men necessary for the execution of these orders. An orderly book is provided by the captain of each company or troop, in which the general or regimental orders are entered.

ORDERS, Holy, a term applied to the different ranks of ecclesiastics. The Anglican and other Reformed Episcopal churches recognize only the three orders of bishops, priests, and deacons. The Roman Catholic Church admits of seven orders; four minor or secular—door-keeper, exorcist, reader, and acolyte;

and three major—deacon, priest, and bishop. The admission to the three latter constitutes the sixth sacrament of the Romish Church, and this sacrament is held to produce an indelible character, and consequently incapable of being forfeited or validly repeated. The Greek Church, like the Romish, has the distinction of major and minor orders, but commonly excludes the subdiaconate from the major orders, while all the functions of the four minor orders of the Romish Church are united by the Greeks in the single order of reader.

ORDERS, MILITARY. The secular military orders are societies established by princes, the members of which are distinguished by particular badges, and consist of persons who have done particular services to the prince and state, or who enjoy, by the privileges of birth, the highest distinctions in the state. They originated from the institutions of chivalry and the ecclesiastical corporations, and were, in the beginning, fraternities of men, who, in addition to particular duties enjoined by the law of honour, united for the performance of patriotic or Christian purposes. Free birth and an irreproachable life were the conditions of admission. From societies established, under certain rules, for the care of sick persons, as well as the diffusion and support of the Christian religion, first proceeded the religious military orders, of which the oldest is the order of St. John of Jerusalem. Their laws were similar to the rules of the monastic orders. The pope's confirmation was essential to their establishment, and he was in a manner their head; their superiors and masters, however, were chosen by themselves by a majority of voices. On their model the secular military orders were formed in later times, which united religious with military exercises. They also bore outward badges, as the religious orders had done in earlier times, after the example of the crusaders. This, with the religious military orders, was most commonly a cross, which the secular adopted also, differing, however, from the simple emblems of their spiritual brethren by the intermixture of worldly ornaments, by a diversity of colours, precious stones, and precious metals. The subsequent period made changes therein, and added ribands and stars. But the original pious object of these orders was also changed, and they acquired by degrees their present character. The statutes, indeed, sometimes speak of the defence of the Christian faith, and similar pious objects; but those precepts are not carried into effect.

ORDERS, RELIGIOUS, are associations bound to lead strict and devotional lives, and to live separate from the world. They are subjected to a perpetual obligation to their monastic vows, or the rules of their order. (See MONASTERY.) The monks and nuns of the East, particularly of the Greek Church, follow the rules of St. Basil, as do also the Basilians in Spain. In the Roman Church, on the contrary, the fundamental rules of the monasteries were drawn up by St. Benedict of Norcia, who is to be regarded as the first founder of a spiritual order. The monasteries of the eastern churches bear the names of their common founders and guardian saints, but without being so closely united to one another as the members of spiritual orders in the West. According to the rules of St. Benedict, the principal vows to be assumed by every novice after a year's probation are those which enjoin the duty of prayer at certain hours of the day, labour, perpetual celibacy, and a renunciation of the pleasures of the world, unconditional obedience to the superiors of the order, and constant residence in the monastery. As these rules and the black cowl were common to almost all the monks and nuns in the West, from the sixth to the beginning of the tenth century, the Benedictine order may be regarded as the only one existing during that period. Still, however, the monasteries belonging to it were under the government of bishops, with no common superiors, and were divided into several congregations, differing by a more or less strict observance of their rules; for example, the Benedictines of Clugny, of Monte-Casino, of Monte-Vergine, of Monte-Oliveto (Olivetans), of Valladolid, of St. Vannes, of St. Maurus, of Mölk, &c. The desire to give more strictness and sanctity to the monastic life was manifested in the middle ages by the establishment of new rules, founded on those of St. Benedict. Thus arose the Camaldulians, the Gray Monks of Vallombrosa, the Silvestrines, the Grand Montanists, the Carthusians, the Celestines, the Cistercians, the Bernardines, Feuillants, Recollets, the nuns of Port Royal, the Trappists, and the order of Fontevraud. The reputed rules of St. Augustine were adopted by a large number of religious orders. Augustine had united only the clergy of his cathedral, and several other churches of his diocese, to lead a canonical life: that is, a life of celibacy, poverty, seclusion, and formal devotion at certain prescribed hours; but he never had an idea of founding an order of monks. Moreover, the monks, who were reckoned among the laity in the seventh century, could not adopt the rules of Augustine, which were first designed for the clergy. But in the eighth century they began to be viewed as members of the clerical order, and in the tenth, by receiving permission to assume the tonsure, they were formally declared clergymen. Indeed, public opinion and several Papal bulls placed them, as superior in sanctity, above the secular clergy, who for this reason often became monks, or formed associations for the performance of monastic vows and leading canonical lives. Of this description are the canons regular, whose constitution was formed on the rules of St. Augustine; for example, the monks of St. Saviour in the Lateran, of the Holy Sepulchre, of St. Geneviève, &c. The Præmonstratenses, Augustines, Servites, Hieronymites or Jeronymites, Jesuits, and Brigittins are regular orders, according to the rules of St. Augustine. Under the class of regular orders, but more devoted, according to the ancient ideas of monastic life, to silent contemplation, and secluded from the world, are included also the peculiarly constituted Carmelites. The Trinitarians or Mathurines and the order of Grace showed more inclination to mingle with the world. A readiness to accept hierarchal importance and influence over the world was characteristic of the Mendicants, an order of Dominicans (preaching monks, Jacobins), established in the beginning of the thirteenth century, and of the Franciscans (Minorites, Conventuals, Observantines, Cæsarines, Amadeists, nuns of St. Clare, Spirituals, Eremites or Celestines, Fraticelli, Alcantarines, Cordeliers, Capuchins); from which the Minims or Paulanites, who belong to the same class, are distinguished by their devotion to a silent, contemplative life. The Dominicans and Franciscans received from the popes certain immunities which are known as the privileges of mendicant friars, and they were afterwards granted in part to the Carmelites, Augustines, Servites, and Paulanites. They consisted in freedom from all secular and episcopal jurisdiction; in the privilege of demanding alms of everybody out of the monasteries; in authority to preach everywhere, without regard to the parochial rights of the priests; to hear confessions, to read masses, and sell Papal indulgences. These immunities served as a compensation for the strictness with which they were forbidden, by their ancient rules, to possess any property. Although the establishment of new orders of monks had been expressly prohibited by some councils, several new institutions of this nature,

which arose after the beginning of the sixteenth century, were able, by promising to devote their exertions to the common good, to procure the approbation of the pope, and thus to escape the prohibition, provided that they did not pass for new orders of monks, but called themselves regular canons of St. Augustine, and dressed in the black garb of the secular clergy. The immense loss which was sustained by the ancient orders in consequence of the Reformation induced the popes zealously to encourage these establishments. To this rubric belong the Theatines, the Barnabites, the Somaskians; in France, the Priests and Fathers of the Oratory, the Lazarists, Bartholomæans, Piarists, and the Brethren of Mercy. As the secluded life of the monks, soon after the origin of monasteries, had given rise to similar associations of pious females, so nuns commonly banded together as new orders of monks arose, and formed societies under similar names and regulations. There were Benedictine, Camaldulian, Carthusian, Cistercian, Augustine, Præmonstratensian, Carmelite, Trinitarian, Dominican, Franciscan, Paulanite nuns, and many orders of regular canonesses, whose monastic vows and the colour of their dresses corresponded with those of the male branches; but naturally they never had the same influence as the monks were able to exercise. The male branch of an order is denominated the *first order*, and the female the *second;* thus the Capuchin friars belong to the first order and the Capuchin nuns to the second order of St. Francis. There were also congregations of nuns, who united with certain orders of monks without adopting their names; as the Urbanist nuns, the nuns of the Conception of the Blessed Virgin, in Italy and Spain, and the nuns of the Annunciation of Mary, who belonged to the second order of St. Francis, and the English sisters, who followed the rule of the Barnabites. The nuns of the penance of St. Magdalen, the Salesian nuns, the Celestial Annunciadæ, the Ursuline and Hospitaller nuns, or Sisters of Mercy, are female orders existing independently of any male orders, and living according to the rules of St. Augustine. Besides the nuns composing the second order, almost all the important religious orders received new accessions in the lay brethren (*fratres barbati* or *conversi*) and lay sisters, who were taken to perform the necessary labours of the monasteries, and to manage their intercourse with the world, in order that the choristers, that is, the proper religious, who performed the appointed prayers in the choirs of the churches, might not be distracted in their studies and devotions. The first example of this arrangement was given by the order of Vallombrosa, and soon imitated in the monasteries of other orders. It became gradually an instrument of considerably increasing the power and influence of the monastic institution.

Under the name of *offerings* and *presents* vast numbers devoted themselves, their property, and their influence to the service of religious orders without formally becoming members of them. Whole families, married persons of all ranks, in this way made themselves dependent on the regular clergy. St. Francis of Assisi first gave this relation of dependence a distinct form. He united the laymen who wished to associate with the brethren of his order without becoming clergymen into a particular society under the name of the *third order of Minorites*. After this model were formed (besides all the mendicant orders) the Cistercians, the Trinitarians, and the Monks of Grace of the third order, of whom only a few went into retirement, and bound themselves by solemn monastic vows. Most of the members, indeed, were laymen, who retained their civil and domestic relations, and engaged only to lead a religious life without quitting the world. This engagement required them every day to repeat some *Ave Marias* and the *Paternoster*, and to fast at certain specified times. The members of every third order are called *tertiarians* or *tertians*, and are distinguished by their rich presents to the monasteries and mendicants of their order, and their zeal in every way to promote its interests. They are at liberty to wear the full dress of their order, but generally content themselves with wearing the scapulary or girdle like an amulet under their ordinary garb.

The association of these third orders with the others afforded to the first many means of increasing its power and influence, and accordingly the system was kept up, extended, and favoured to a great degree. However, dissensions at length arose between the different religious orders in consequence of this association of the laity with the clergy, and these could be settled only by formal compacts marking out the limits of their possessions and their influence, and by mutual agreements respecting persons passing from one order to another. To the original intent of monastic institutions, that their members should serve God by prayer, and benefit the world by instruction and example and benevolence, was added the policy of making them, through their political and other influence, a support and bulwark of the Church. The orders first established governed themselves in an aristocratico-republican manner. The Benedictine monasteries were long independent of one another. The Cistercians obeyed a high council made up of the abbot of Citeaux as the superior, the abbots of Clairvaux, La Ferté, Pontigny, and Morimand, and twenty other counsellors. The abbot and priors of all the Cistercian monasteries were responsible to the general chapters, held at first every year, and afterwards every third year. Inferior orders, as the Carthusians, Grand Montanists, &c., with similar constitutions, had to contend with bishops also, whose ancient claims to the jurisdiction of all the monasteries in their diocese they could not so easily throw off as the Benedictines and Cistercians, who were favoured by the Papal immunities.

But the *mendicant* orders at their very commencement placed themselves in a much more intimate connection with the popes. Dependent solely and immediately on Rome, by virtue of the privileges which they received, they preserved the strictness of their organization with a success which, in the government of large associations of men, could be maintained only by the unity of the ruling power and the blind obedience of the subjects. Most of the other orders soon adopted the same constitution. Accordingly at the head of every religious order stands a general or governor, who is chosen every three years from the officers of the institution, resides at Rome, and is responsible only to the pope. In some orders, however, he has in his attendance a monitor, who watches his proceedings in behalf of the order, and may remind him of his duty when his proceedings are unconstitutional. The counsellors of the general government are the provincials, officers to whom is committed the supervision and government of monasteries in the separate provinces. They form, under the presidency of the general, the chapter of the whole order, and preside as general vicars over the provincial chapters, in which the superiors of the separate monasteries of a province take part, as members entitled to vote (*suffraganei*). These officers have various names in the different orders, namely, *abbots, priors, superiors, ministers, guardians, provosts*, or *rectors;* and in the sense of the canon law they are *prelates*. They transact each of them the affairs of his own monastery in a chapter or assembly with the religious in it belonging to the choir. Hence the choristers are denominated *conventuals* and *fathers*

(*patres*), to distinguish them from the inferior monks, who are called *brothers* (*fratres*), because they have not been consecrated to the office of priests, or are only lay brethren who perform the domestic duties of the monastery. Moreover, in the mendicant orders none but the latter are sent out to receive contributions. The fathers alone, on the other hand, are authorized to perform the duties of the priestly office in the monastery and in parishes under their patronage. The chapters of the individual monasteries of a province are under the provincial as their officer in the first instance. The highest tribunal for all the members of an order is its general, who is also the president of the second and third orders. The convents of the nuns are under a similar government, only they cannot be without a provost, who, with his chaplains, performs religious services among them. If they belong to no second order, they are, like the Hospitallers and all unprivileged monasteries, under the jurisdiction and superintendence of the bishop or the prelate of the diocese where they reside, who is clothed with episcopal authority. Unprivileged orders and monasteries have often fulfilled their original destination as faithfully as the privileged and strictly exclusive orders. See the articles on the various orders, MONASTERY, &c.

ORDERS IN COUNCIL. See PRIVY-COUNCIL.

ORDERS OF ARCHITECTURE. See ARCHITECTURE.

ORDINAL, the prescribed form of service used at the ordination of clergy, as in the English, Roman Catholic, and Eastern churches. The ordinal of the English Church was originally drawn up in the time of Edward VI. It was altered to some extent in the reign of Queen Elizabeth, and was again revised in 1661. It was founded on an older form dating from early mediæval times, the Roman Catholic ordinal being also based on the same original type. Ordinals appear very early in the history of the church, the books of this kind containing not only forms of ordination but forms for all offices, as the consecration of churches, &c. There are Greek, Coptic, Nestorian, &c., ordinals.

ORDINARY is a term applied in civil law to any judge who can take cognizance of certain causes by the powers which belong to him in virtue of his office, and which are not conferred upon him by delegation. In English law it is used mainly with reference to ecclesiastical judges. A bishop is ordinary in his own diocese, and an archdeacon in the whole of his province for the purpose of visiting and receiving appeals from inferior jurisdictions. A commissary or official of a bishop or other ecclesiastical judge is likewise an ordinary. The term is derived from the writers on canonical law, who sometimes style the pope 'ordinary of ordinaries' (*ordinarius ordinariorum*). Formerly in England the probate of wills, the granting of letters of administration, and certain matrimonial matters were under the authority of the ordinary, but these matters have been removed from his jurisdiction, being now under the cognizance of the supreme court, and allotted to the Probate, Divorce, and Admiralty division of it. In Scotland the term is applied to certain judges in the outer house of the Court of Session, such judges being termed *lords ordinary*. A physician or chaplain statedly attending in actual service is called a physician or chaplain *in ordinary*.

ORDINARY, in naval affairs, is applied to the establishment of shipping not in actual service, each such ship being secured in some safe place in the neighbourhood of one or other of the dockyards, and placed under the charge of a few men. A certain number of these ships constitute a division, under the command of a lieutenant. An *ordinary* seamen is one not qualified to take the helm or sail the ship, and is thus distinguished from an *able* seaman.

ORDINARY RAY. When a ray of light passes into a crystal of Iceland-spar it divides into two rays which pass through the spar in different directions, and which are known to be polarized in planes (see POLARIZED LIGHT) at right angles to one another. The ray which in its refraction obeys the well known law—the incident and refracted rays are in a plane perpendicular to the refracting surface, and the sine of the angle of incidence bears a constant proportion to the sine of the angle of refraction—is called the ordinary ray. The other, or 'extraordinary' ray, is in general less refracted than the ordinary ray, and obeys a much more complex law than the ordinary law of refraction.

ORDINATION, the initiating of a Christian minister or priest into his office. The English Church considers ordination as a real consecration, the power of communicating which has descended from Christ through the apostles and bishops. There is, however, a diversity of opinion on this point, the high-church party maintaining the dogma of the regular transmission of the episcopal office from the apostles down to the bishops of the present day, whilst this is denied by the low-church. For ordination in the English Church, subscription to the thirty-nine articles, acknowledgment of the temporal and spiritual supremacy of the sovereign, and the declaration that the Book of Common Prayer contains nothing contrary to Scripture, are requisite. The ceremony of ordination is performed by the bishop by the imposition of hands on the person to be ordained. In the English Church, and in most Protestant countries where the church is connected with the state, ordination is a requisite to preaching; but in some sects ordination is not necessary for that purpose, although it is considered proper previous to the administration of the sacraments by the preacher. In the Presbyterian and Congregational churches ordination means the act of settling or establishing a licensed preacher over a congregation with pastoral charge and authority, or the act of conferring on a clergyman the powers of a settled minister of the gospel without the charge of a particular church, but with general powers wherever he may be called upon to officiate. The Catholic dogma of ordination is founded on John xx. 21, 22. The spiritual power of ordination it considers as descended from the apostles through the bishops. See ORDERS (HOLY).

ORDNANCE. See CANNON, ARTILLERY, GUN, HOWITZER, MORTAR, &c.

ORDNANCE DEPARTMENT, the department of the British government which formerly provided the troops of the line, artillery, engineers, militia, and navy with guns, ammunition, and all kinds of arms, besides administering the affairs of the artillery and engineer regiments. Upon this department also devolved the duty of providing all the troops at home with forage, and of erecting fortifications and other military works at home and abroad, &c. The department comprised the master-general of the ordnance, the surveyor-general, the clerk of the ordnance, and the principal store-keeper. After the existence of this department for upwards of 400 years it was abolished on the 25th of May, 1855, during the progress of the Crimean war, as it was found not to work harmoniously with some of the other government departments. Its functions are now discharged partly by the war office and partly by the Horse Guards.

ORDNANCE SURVEY is the term applied to that system of observations conducted by the British government with a view to the construction of more accurate maps of the country. The first such survey

was made in Scotland, and originated in the desire to have a reliable map of the northern parts of that country, in connection with the rebellion of 1745. It was performed under the direction of Lieutenant-general Watson and Major-general Roy, and completed in 1755, the drawing being on the scale of 1¾ inch to the mile. Events, however, intervened to prevent its publication. In 1763 a proposal was made to have a survey taken of the whole of the kingdom; but it was not till 1784 that steps were taken to give effect to the proposal. In April of that year a survey was made by General Roy, R.E., under the auspices of the king and of the Royal Society, for the purpose of ascertaining by trigonometrical measurement the difference of longitude between the observatories of Greenwich and Paris. Soon after this the government decided on having a general trigonometrical survey made of the entire kingdom, on the scale of 1 inch to the mile, for military purposes; and General Roy's triangulation in the south-eastern counties became the basis of the great triangulation, which was gradually extended over the whole of the British Isles, and completed in 1852. The work was frequently suspended. In 1824 it had extended in its course northwards through England and Wales till it reached the southern borders of Yorkshire and Lancashire. At that time, however, the work was transferred to Ireland, a survey of that country on a large scale being required for the purposes of land-valuation. The scale agreed upon for this survey was 6 inches to the mile, and the work was completed in 1840. The 6-inch scale was found to possess so many advantages that government assented to its adoption for those parts of the kingdom yet unsurveyed. By 1851, accordingly, Yorkshire, Lancashire, the Isle of Lewis, and several counties in the south of Scotland, were finished on the 6-inch scale; in that year, however, the 6-inch scale was replaced by the 1-inch scale; but this also was replaced by another. Much time was wasted and much useless expenditure incurred through the indecision of Parliament as to the scale to be adopted. The main point of the controversy in regard to the scales was whether the 6-inch or some larger scale was best fitted for the national map. In 1853 a statistical conference held at Brussels, and attended by twenty-six delegates from the chief states of Europe, considered the question of national maps or *cadastres*, and pronounced unanimously in favour of a scale of $\frac{1}{2500}$ of nature, or 25·344 inches to the mile. This scale possesses several advantages, one of the chief being that it corresponds with the scales adopted for the national maps and plans of the chief countries of Europe. It was not, however, till 1863 that a final decision was come to by the British government with regard to the scales to be used. The final instructions for the publication of the surveys of the United Kingdom are briefly as follows:—

1. A topographical map of the whole of Great Britain and Ireland, on the scale of 1 inch to a mile, or $\frac{1}{63360}$. 2. County plans of the whole of Great Britain and Ireland on the scale of 6 inches to a mile, or $\frac{1}{10560}$. 3. Parish plans of the cultivated districts in England and Scotland, excepting Yorkshire, Lancashire, the Isle of Lewis, and the six counties in the south of Scotland previously finished on the 6-inch scale, on the scale of 25·344 inches to a mile, or $\frac{1}{2500}$. 4. Plans, on the scale of $\frac{1}{500}$, or 126·72 inches to a mile, of all towns with more than 4000 inhabitants, excepting London and its environs, for which the scale of 60 inches to a mile has been selected.

The 1-inch sheets are arranged without reference to the sheets on other scales. Those of Scotland are drawn to a central meridian for that country, on Flamsteed's modified projection. Ireland has likewise its own meridian. But England and Wales, in the earlier 1-inch maps, laboured under the disadvantage of having several meridians, though now one central meridian, that of Delamere in Cheshire, has been adopted. The 6-inch sheets are constructed separately for each county, with reference to a central meridian for that county, except in cases where two or three counties lie so well north and south of one another that the same meridian serves for more than one.

The rules by which the main lines for this and all other extended surveys are obtained are derived from the principles of trigonometry. By these principles we are enabled to compute the exact form and dimensions of any triangle from the actual measurement of one side only, and of the angles formed at its extremities by the other sides. Upon these principles the true figure and size of the earth have been determined upon the relative lengths of degrees of a meridian in different latitudes. As the exactness of the results of the operations depends upon the correct measurement of the one side or *base-line*, and of the angles at its extremities, the apparatus employed must act with the greatest delicacy. The principal base-lines in the great triangulation were measured with General Colby's 10-feet compensation bars; an apparatus so constructed by the combination of bars of iron and brass that the distance between two fine dots, on steel tongues connecting them at their extremities, remains constant at all temperatures. For determining the angles the English officers, in the great triangulation (1784–1852), used an excellent theodolite by Ramsden, having both an altitude and an azimuth circle, and a telescope of great power; it is capable of measuring horizontal angles to fractions of a second. In this triangulation the positions of about 250 trigonometrical points, in all parts of the country, have been determined with the greatest precision. Two principal base-lines and four bases of verification were measured; the former being situated the one on Salisbury Plain and the other on the border of Lough Foyle; and the latter situated respectively on Hounslow Heath, at Misterton Carr, Belhelvie, and Rhuddlan Marsh. The accuracy of these measurements is so great that only a few inches of error have been discovered in a distance of 100 miles.

When the primary triangulation has been carefully completed, a further subdivison of each of the great triangles is performed, and each of these again is subdivided into others, so that the entire plot of the country is represented by a complete net-work of triangles. Each of these divisions and subdivisions being formed independently of the others, and yet the exact accordance of the whole being insisted on and effected, accuracy is secured in all these principal operations; and the filling in of each of these spaces is intrusted to a different class of operators, whose labours in producing the final plan are so divided and arranged that the work of each is a check upon the exactness of his predecessor. Thus the *surveyors* measure the lines and angles on the ground, the *plotters* produce the plan from the records of the surveyors, and the *examiners* test the plan thus produced by subsequent comparison in the field. One effect of this system is, that the bulk of the work after the triangulation may be safely intrusted to an inferior and more cheaply-paid class of assistants, and great comparative economy thus secured.

In 1882 the survey of Great Britain and Ireland may be said to have been completed on the plan originally contemplated; the work now in progress being the resurvey on the 25-inch scale of that portion of England to the south of Yorkshire and Lancashire, which had previously been published on the 1-inch

scale, and the revision of the 6-inch map of Ireland. The whole of Scotland has now been published on the 6-inch scale. Extra surveys on specially large scales are in progress in some parts. The more important purposes which a national map should subserve are the valuation of property for the equitable adjustment of taxation and assessment; the sale and transfer of land; railway and other civil-engineering works, large sanitary and drainage schemes, military engineering works, geological, hydrographical, and mineral surveys, &c. For many of these purposes a scale of not less than 25 inches to the mile is necessary; hence the advantage of having maps on such a large scale.

In 1870 the ordnance survey, originally under the control of the old board of ordnance, whence its name, and latterly under that of the war-office, was transferred to the office of works. The essential feature of the survey organization is the combination of military and civilians, on a plan which has been found to work well hitherto, both in respect to method and economy.

Besides Great Britain, nearly all the states of Europe have produced trigonometrical surveys, many of them of great excellence. A trigonometrical survey has also been made of India, the maps being published on a scale of $\frac{1}{4}$ inch to the mile.

ORDONNANCES was the name given in France, before the revolution of 1789, to all the decrees of the king or regent. In a wider sense they were composed of ordonnances, properly so called, having for their objects all matters of public law and edicts relating to finance, and of declarations, letters-patent, and regulations relative to the interpretation, confirmation, and application of the laws. Ordonnances, in a narrower sense, were like edicts and declarations signed by the king, countersigned by a secretary of state, sealed with the great seal, and recognized (*visées*) by the keeper of the seals. In order to remedy the immense confusion which had been produced, Louis XIV. ordered a collection of all the ordonnances which had been issued by the kings of the third dynasty. When completed it consisted of twenty folio volumes, extending from 1051 to 1497. Ordonnances were suppressed during the revolution of 1789, and replaced by decrees of the executive, until the restoration of the Bourbons in 1814. From that period till 1848 the term ordonnances was applied to those orders emanating from the king with the design either of regulating matters of administration or of determining the measures necessary to the execution of any law passed by the chambers. Since 1848 the term ordonnances, as thus applied, has disappeared, and been replaced by *decrees*, having the same application.

ÖREBRO, a town of Sweden, capital of the län of same name, on the small river Svart-Elf, at the head and western extremity of the Hjelmar Lake, 101 miles west of Stockholm. It contains a handsome church, with interesting monuments; an ancient castle, a town-house, assembly-house, with a reading-club; an hospital; and an old house, of some historical interest as the residence of Gustavus Vasa and of Charles IX., the place where an assembly of the States was held in 1540, and Bernadotte was elected crown-prince in 1810. The manufactures consist of linen cloth, wax-cloth, hosiery, paper, and tobacco; and there is a considerable printing establishment, from which some of the best Swedish works are issued, and in connection with it a type-foundry. Örebro was the first Swedish town in which the Reformation was formally established (1529). Pop. 11,785.—The län consists generally of undulating plains, watered by numerous streams, and containing many lakes. The only hilly district is in the north, where there are several forests, and valuable iron and other mines. The pastures rear fine cattle. The only exports of consequence are iron and timber, transmitted to Stockholm or Gottenburg. Pop. (1882), 180,388.

OREGON, one of the United States, on the Pacific coast, bounded north by the Columbia, which separates it for the most part from Washington Territory; east, the territory of Idaho; south, Nevada and California; and west, the North Pacific Ocean; area, 96,030 square miles. The coast-line, which has an extent of 300 miles, is generally rugged and precipitous; but so little indented as not to contain above three or four harbours. The interior consists of wide and elevated plateaux, which are intersected by two great ranges, dividing the whole territory into three distinct portions. The first of these portions stretches north to south along the Pacific, and east from it for a width of 100 miles to 150 miles; and is then hemmed in by a lofty mountain-chain, which is called the Cascade Range, and occupies the whole breadth of the territory from S.S.W. to N.N.E. The other two portions, much more irregular in shape, are formed by a range which, under the names of the Blue Mountains, and the Klamet or Klamath, finally bends round to the south-west, and becomes linked to the Cascade Range. Though the quantity of arable land is comparatively small, the pastures are large and rich; the forests abound with pines of almost unrivalled magnificence, and the metalliferous fields which have made California so famous are traced into Oregon. Gold has been found in various places from Port Orford to Burnt and Powder Rivers, and mines of it have been successfully worked east of the Cascade Range. Silver, copper, iron, and coal exist in the state. The largest river is the Columbia, which forms three parts of the northern boundary of the state, and flows nearly due west to its mouth in the Pacific. Its great tributary, the Snake River, flowing north, and serving as the boundary of a great portion of the state eastwards, and its affluents, the Wallawalla, John Day, and Fall Rivers, on the east side of the Cascade Range, and the Willamette on the west side, all flowing into the Columbia, are the other principal rivers. Several of these, besides others, are more or less navigable. The principal ports of Oregon are Portland and Astoria, the former on the Willamette 12 miles above its junction with the Columbia, the latter at the mouth of the Columbia itself. The principal exports are grain and flour, wool, dead-meat, hides, fish, &c. The length of railways open for traffic within the state at the end of 1882 was 807 miles. Oregon, originally organized as a territory, and then comprising the territories of Washington and Idaho, since detached from it, was admitted into the Union as a state in 1859. The pop. in 1850 was about 13,000; in 1870, 90,922; and in 1880, 174,768.

OREL, a government of Russia, bounded on the north by Tula and Kaluga, north-west by Smolensk, west and south-west by Czernigov, south by Koursk, south-east and east by Voronej, and north-east by Tambov. The area is 18,042 square miles. Its surface, though flat, is elevated, and is occasionally intersected by limestone ridges, inclosing deep romantic valleys. The principal rivers are the Desna in the west, the Oka in the middle and north, and the Sosna in the east. The soil, though rather light, raises corn and hemp in abundance, and some good hops and tobacco. Live-stock, particularly horses, are extensively reared from improved breeds. Education is greatly neglected, and the one only printing-press within the government belongs to the authorities. The inhabitants are very industrious, and generally in good circumstances, but they have little enterprise. Pop. (1880), 1,852,880.

OREL, or ORLOV, a town in Russia, capital of the government of same name, on the Oka, 201 miles S.S.W. of Moscow. It consists of narrow streets and houses built principally of wood, and has not yet recovered from the effects of a dreadful fire in 1848. It has manufactures of linen, tanneries, rope-works, worsted-mills, &c.; and is well situated for trade, communicating by water with the Black Sea, the Caspian, and the Baltic, and thus forming an important entrepôt, especially for St. Petersburg and Moscow. Pop. 54,889.

ORELLI, JOHN CASPAR, a distinguished philologist and critic, born at Zürich in 1787, received his first education at Wadensweil, where his father was for a long time landvogt. In 1799 he entered the Carolinum of Zürich, and devoted himself with great diligence and success to the study both of the ancient and modern languages and literature. After a short residence at Vevay he became acquainted with Pestalozzi at Yverdun, and with his system of education, in which he took a deep interest. In 1806 he was ordained to the pastorate charge of the Reformed Church at Bergamo. In a few weeks he made himself master of Italian, and subsequently conducted his pulpit ministrations in that language with marked success. In 1813 he was appointed professor at the college of Coire, a post he filled with great acceptance till, in 1819, he was made professor of eloquence and hermeneutics in his native town. In 1833, on the founding of the University of Zürich, he took an active part in its organization, and was appointed to the chair of philology there, though he still retained his post at the Carolinum. During this last and most influential period of his life he composed and published most of his literary works; and also by his animated lectures imbued numerous students with an ardent attachment to the writings of the ancients. He at the same time took an active interest in all the stirring occurrences of his time, in the struggle for the emancipation of Greece, the political reform of his native country, and improvements in the system of education. He died in 1849. His reputation rests principally on his editions of the Greek and Roman classics, which have attained a well merited celebrity. His comments are characterized by great accuracy of knowledge; he goes direct to the point to be elucidated, and without unnecessary verbiage states all that is necessary to make the author's meaning clear. Among his numerous editions of Latin classics may be mentioned those of Horace, Tacitus, and Cicero. Connected with the last is his valuable Onomasticon Tullianum. He had a principal share in Baiter and Sauppe's edition of Plato. He also wrote several works on Italian literature, which was a favourite study with him.

ORENBURG, a government of Russia, partly in Europe and partly in Asia, with an area of 73,950 square miles. A very large part of the surface consists of steppes, with few trees, and roamed over by vast herds of cattle; other parts are densely wooded. The best agricultural districts are in the north-west, where grain is raised for export. The principal mountain chain is the Ural; the largest rivers are the Tobol, Abuga, Oui, and Mijas, belonging to the basin of the Arctic Ocean; and the Biela, Samara, and Ural, with its tributaries, belonging to the basin of the Caspian. The minerals are very valuable and yield a large revenue to government. Gold abounds along the whole Ural chain, and copper, iron, and salt on the plains which lie on either side of it, but more especially in the east. Manufactures are limited, but the trade with nomadic and other tribes is of great extent, the principal articles being corn, horses, cattle, sheep, hides, furs, honey, wax, metals, salt, tallow, and fish. In 1865 the government of Ufa, with a population of 1,265,000, was formed out of Orenburg proper. Pop. (1880), 1,096,376.

ORENBURG, a town of Russia, capital of the government of the same name, on a slope above the right bank of the Ural, has spacious and regular but ill-paved streets. The houses, mostly of wood, have a pleasing appearance. The principal buildings are ten stone churches, all Greek, except a Protestant and a Roman Catholic, two mosques, a governor's house, exchange, custom-house, merchant-house, and Bashkir caravansary. The chief manufactures are woollens, partly for army clothing, leather, and soap. There are also many large tallow-melting houses. The trade, carried on principally by caravans from Khiva and Bokhara, is very extensive. In the vicinity of the Tauschhof are immense smelting-houses, in which, in the course of a summer, the tallow of more than 50,000 sheep is melted down. Pop. (1880), 35,000.

ORENSE, a town in Spain, Galicia, capital of the province of same name, 73 miles south-east of Coruña, on the left bank of the Minho, here crossed by an ancient and lofty bridge. It is a very ancient place, and had a cathedral as early as 550, though that now existing was not erected till 1220. Besides this edifice, which is Gothic, there are several churches and convents, a theatre, and town-house. The last is in the principal square, which is surrounded by colonnades. Orense was the scene of important military operations during the Peninsular war. Population, 12,586. The province of Orense, the smallest and poorest in Galicia, has an area of 4508 square miles, and a population of 388,835. It raises a good deal of maize, and has mines of tin, copper, and iron.

ORES. See the articles on the various metals; also MINE and MINING.

ORESTES, in Greek mythology, the son of Agamemnon and of Clytemnestra, the hero of several Greek tragedies, in which he is represented as the deliverer of his sister, and the avenger of his father, by becoming the murderer of his mother. Of the pieces of which his history was the subject there remain the Choëphori and the Eumenides of Æschylus, the Electra of Sophocles, and the Orestes and Iphigenia in Tauris of Euripides. Orestes, saved by his tutor with the assistance of Electra from the fate of his father, was brought up in the house of his uncle Strophius, prince of Phocis, and formed with his son Pylades that intimate friendship which has become proverbial. Called upon by the Delphian god to avenge his father, he hastens back to Mycenæ. To conceal himself he has recourse to artifice. His tutor and Pylades appear with an urn, which they pretend contains the ashes of Orestes. Clytemnestra hears the news of her son's death with a joy which she can hardly conceal; but she soon falls under his dagger. Ægisthus undergoes a similar fate. But, according to the notions of the Greeks, the murderer of his mother became a prey to the Eumenides or Furies. These terrible goddesses unrelentingly pursue the unhappy prince, and at last drive him to madness. He flees to Delphi, still pursued by the avenging deities; but an oracle of the god informs him that his torments will cease when he shall have carried back the statue of Diana from Tauris to Argos. Upon this information Orestes sails with Pylades to Tauria. His sister Iphigenia, an unknown stranger, was here living as a priestess of Diana. An old law commanded that every stranger should be sacrificed to the goddess. Iphigenia was about to offer up her brother; but a recognition takes place, they seize the image of Diana, and, together with Pylades, come to Argos. The infernal deities were now appeased.

Married to Hermione, daughter of Menelaus, Orestes ruled over his paternal kingdom of Mycenæ, and over Argos, upon the death of its king, who left no heirs. An oracle induced him to travel into Arcadia, where he lived in the city of Orestia, and died at a very advanced age, from the bite of a snake. His bones were afterwards carried to Sparta.

ORFILA, Matthew Joseph Bonaventure, a Parisian physician and chemist, particularly known for his researches in connection with medical jurisprudence, was born in 1787, at Mahon, in the island of Minorca, where his father was a merchant in good circumstances. He attended the schools of his native town, travelled in 1801 in Egypt and Italy, and, though originally intended for the naval service, turned his attention to medicine, which he studied at Valencia, Barcelona, Madrid, and Paris. Having taken his degree of M.D. in the latter capital, he delivered lectures on botany, chemistry, and anatomy, which, along with his medical practice, soon gave him a high reputation and a prominent position. In 1816 he declined an invitation to fill the chair vacated by the chemist Proust at the University of Madrid; and having been naturalized in France in 1818, was next year appointed professor of medicine and toxicology at Paris. This situation he resigned in 1822, and in 1823 became professor of medical chemistry and medical jurisprudence. His first important work was Traité des Poisons, or Toxicologie Générale (two vols. Paris, 1813), which some years after was followed by his Éléments de Chimie appliquée à la Médecine et aux Arts (two vols. Paris, 1817; eighth edition, five vols. 1851). This latter work does not possess so much the merit of being original as of putting in a popular form the researches of others. Louis XVIII. appointed him his body physician, and Louis Philippe made him a grand officer of the Legion of Honour, dean of the medical faculty, member of the general council of hospitals, and general counsellor of the department of the Seine. He displayed an extraordinary activity in judicial investigations, and was thus often involved in disputes, in which his strong conservative leanings had no small share. One of his most celebrated controversies was that with Raspail on the occasion of the process Lafarge. Similar discussions arose in connection with the process Bocarme. Most of his works, besides those above named, and more especially his Leçons de Médecine Légale and his Traité de Toxicologie, have been repeatedly reprinted in the original, and translated into most of the languages of Western Europe; while one of them, entitled Secours à donner aux Personnes empoisonnées ou asphyxiées, has even been translated into Turkish and Arabic. In connection with Lesueur he took a part in the Traité des Exhumations Juridiques. Other works of his are: Mémoires sur plusieurs Questions Médico-légales (Paris, 1839); Recherches sur l'Empoisonnement par l'Acide arsénieux, précédées d'une Histoire de l'Arsenic metallique (Paris, 1841), besides numerous contributions to medical journals. After the revolution of 1848 had deprived him of his situation in the medical faculty he intermingled less in public life, and died at Paris in 1853.

ORFORD, Earl of. See the two articles Walpole.

ORGAL, or Argal. See Argal.

ORGAN (from the Greek *organon*, an instrument), the grandest of musical instruments made to sound by wind. As in the human voice, the tones of the organ are produced by the vibrations of the air in the tubes or pipes through which it is propelled. The three essentials of an organ are: (1), a chest of compressed air; (2), a set of pipes in communication with this chest; and (3), a clavier or key-board, by means of which this communication may be opened or closed at pleasure. The air is forced into the wind-chest by means of bellows. To the upper part of each wind-chest is attached a *sound-board*, a contrivance for conveying the wind to any particular pipe or pipes at pleasure. It consists of two boards laid horizontally. On the upper board are arranged parallel rows of pipes, the pipes in each row, regarded longitudinally, being of the same *timbre* or quality of tone, but of a different quality when regarded laterally, that is, as they extend backwards. Under each lateral row of pipes there is a groove or channel in the sound-board for the passage of air from the wind-chest to the perforations in the sound-board by which the pipes communicate with the grooves. Air is admitted into these grooves by means of valves or pallets, which are connected with the keys. On the depression of a key the valve is opened, and the compressed air rushes into the groove, and would, it is obvious, cause all the pipes communicating with that particular groove to sound their respective notes were it not for *the register*. The *register* is a slider which moves in other grooves in the sound-board, cut at right angles to those above mentioned, and communicating by perforations with the longitudinally arranged pipes; it contains holes to correspond with these pipes. By drawing the register or stop the holes of one of these rows are opened, as then the holes of the slider are directly under the entrance to the pipes, and by pushing it they are closed. From this it is clear that by drawing several of these registers corresponding rows of pipes are opened. When a register is open air can be admitted into any of the row of pipes under which it is placed by simply pressing the key that opens the valve of the groove with which it communicates. The series of pipes above each slider is called a stop. The principal stops of an organ are the *open*, *stopped*, and *double* diapasons; the *principal*, *dulciana*, twelfth, fifteenth, *flute*, *trumpet*, *clarion*, *bassoon*, *cremona*, *oboe*, and *vox humana*. Those pipes of the various registers that open into each channel are so constructed that while one shall give a fundamental note, the others shall give the chords of that note. An organ may have several wind-chests filled by the same bellows, and several key-boards, each key-board and wind-chest representing a distinct organ. In the largest instruments the number of these organs generally amounts to five. The most powerful of these is called the *great organ;* a smaller one the *choir organ;* another is called the *swell organ*, from the circumstance of its being inclosed in a wooden box with a front of louvre-boards, which can be worked by the player so as to give diminuendo and crescendo effects to the sound; a fourth is called the *solo organ*, being employed for special solo stops, such as the hautboy, the flute-stop, the vox humana, and others; lastly, there is the *pedal organ*, so called from its key-board being played by the feet. The key-boards for the hand are termed *manuals*, that for the feet the *pedal*. The most usual compass of the manuals is from CC (8 feet) to F in alt, four octaves and a half; that of the pedal from CCC to E or F, two and a quarter to two and a half octaves.

There are two kinds of organ pipes—*flute* pipes and *reed* pipes, of each of which there are several species. Flute-pipes consist, first, of a foot, which is hollow, and receives the wind that sounds the pipe; second, of a body which is attached to the foot. Between the foot and the body of the pipe is a diaphragm or partition, having a small narrow aperture to let out the wind; over this aperture is the mouth, whose upper lip, being horizontal, cuts the wind as it escapes through the aperture and sets it in vibration, so causing the sound. The pipes are made either of pewter, of lead mixed with tin, or of wood. The

metal pipes are generally cylindrical, open at their extremities, and clear in their sound. The wooden pipes are square, and generally stopped at their extremities by a plug covered with leather, so as to be air-tight. The sound of these is softer. The longest pipes yield the gravest, the shortest the most acute sounds. The pipes, however, which are stopped have only half the length of those that are open, for the same sound. The pipes vary in length from 32 feet or so, to the size of the pipe of a very small key. The reed pipes consist of a foot to carry the wind to the reed, a thin tongue of hard brass, one of the extremities of which is fitted into a kind of mould by a wooden plug, and the other is left free to vibrate; and in proportion to the length of that part of the tongue which is at liberty is the depth of the sound. After passing the reed the wind traverses a long pipe, whose dimensions and shape give character and quality to the sound.

Some persons, particularly Jews, suppose, but without foundation, that the organ was used even in the temple of Solomon. Some derive its origin from the bagpipe; others, with more probability, from an instrument of the Greeks, though a very imperfect one—the *water-organ*—as it is known that the first organs used in Italy came thither from the Greek Empire. The invention of the organ is attributed to Ctesibius of Alexandria, about A.D. 200. An organ was presented by Emperor Copronymus to Pepin, king of France, about 755; and in 826 a water-organ was erected at Aix-la-Chapelle. The use of organs, however, was not common before the fourteenth century. At the beginning the instrument was very imperfect; it had only from 12 to 15 broad and large keys, which were struck with the fist and produced the tones of the diatonic scale. The keys in time became smaller, and between the diatonic tones the semitones were inserted. In 1444 H. Drossdorf of Mayence built a great organ, with a pedal. According to others, Bernhard, a German, organist to the Doge of Venice, built the first organ with a pedal between the years 1470 and 1480. Improvements succeeded quickly in the sixteenth century; the division of all the pipes into different stops was now invented, and the tone of the instrument was adapted to the tone of the choir. The bellows were particularly improved, as till then twenty to twenty-four pairs had often existed in one organ, requiring from ten to twelve men to tread them. But the present degree of perfection could not be obtained until Christian Forner had invented, in the seventeenth century, the *wind-chest*, by which an equal pressure of wind can be obtained in all the bellows. A hydraulic engine has been adapted, with success, to the purposes of working the bellows, and it is now pretty generally adopted. By an ingenious piece of self-acting mechanism, the pump works only when the wind-chest is empty, or only partially filled, ceasing when it is full. Mr. Barker, inventor of the pneumatic lever, patented in 1863 a contrivance for transferring some of the work from mechanism to electro-magnetism. An organ built on this principle is termed an *electric organ*. Several improvements have since been made on Barker's patent. The first electric organ constructed in Britain was used at Drury Lane in 1867, and many others have since been erected throughout the country. The principal advantages of this description of organ are that it facilitates the playing, and enables the organist to sit at a key-board at a distance from the organ. One of the largest organs is that in St. Peter's church in Rome; it has 100 stops; that of the Seville Cathedral has also 100 stops and 5300 pipes; one at Weingarten, in Suabia, 60 stops and 6666 pipes; one at Haarlem, 60 stops and 5000 pipes. The organs of Notre Dame and St. Sulpice, in France, are likewise very large; but the largest organ ever constructed is that built in 1870 for the Royal Albert Hall, London. There are five rows of keys for the choir, great, swell, solo, and pedal organs; 138 stops, and nearly 10,000 pipes. The bellows are inflated by steam-power.

The *hand* or *barrel organs* consist of a movable, turning cylinder, called a *barrel*, on which, by means of wires, pins, and staples, are set the tunes it is intended to perform. These pins and staples, by the revolution of the barrel, act upon the keys within, and give admission to the wind from the bellows to the pipes. The *hand-organ* is generally portable, and so contrived that the same action of the hand which turns the barrel gives motion to the bellows. *The American organ* is a free-reed instrument similar in general construction to the harmonium, but with the following important differences. The reeds in the American organ are more curved and smaller than those of the harmonium, having a wider space to vibrate, the result being that the tone is much softer and of a more uniform power. In the harmonium the wind is forced outward through the reeds, whereas in the American organ, by reversing the action of the bellows, it is drawn inwards. The American organ is more easily blown than the harmonium, and its tones are of a more organ-like quality, but it is inferior to the latter instrument in variety of tone and power of expression. These organs were introduced into Britain by Mason and Hamlin of New York about 1860.

ORGAN, ORGANIC FUNCTIONS, ORGANIZATION. When the structure of a living body is examined it is generally found to be composed of a greater or less number of definite parts or elements, generally of diverse nature, but which possess among themselves intimate relations—one part being connected either by structure or by function to another part or parts. These dissimilar parts or elements are termed in a general sense the *organs* of a living body. In this view not only the more distinct structures of animals and plants—such as the liver, heart, cells, vessels, &c.—fall under this definition, but the simpler tissues and membranes, each with its characteristic formation, are also included in the idea of organs. This dissimilarity or difference between the organs or parts of which a living being is composed, forms a very striking characteristic to the structure of lifeless bodies. A lifeless body—such as a mineral—exhibits generally a sameness or homogeneity of structure. Its intimate parts or particles are usually of a similar kind or nature. Hence this broad and patent distinction has resulted in the employment of the terms *organic* and *organized* to express the characteristics of living beings; whilst to the lifeless part of creation the opposing term *inorganic* is applied. From the earliest stages of a living animal or plant the process of formation of new parts and organs by the differentiation of the body-substance may be seen to proceed; and this process of development in the adult results in the production of that complicated structure, the possession of which entitles the body to be termed *organized*. It is further to be noted that no relations, similar to those existing between the organs of a living being, are present in the inorganic or lifeless body. The parts of the latter are connected together in virtue of purely *physical* or *physico-chemical* laws. Whilst in the living being the definite relationship which results in the harmonious working of all the varied structures of the body is maintained through actions and processes known as *vital* in their nature, which processes—whatever their relations with physical actions—exhibit very different characteristics and conditions from the latter actions.

Organization thus means the possession of definite

organs, structures, or parts, which have definite relations to each other. It is important to note the exact relations of this term 'organization' to the subject of life and vital action; since much confusion formerly existed on this point. Former definitions of life occasionally asserted that organization was the *cause* of life. In other words, that a body *lived* because it was organized; or because it had definite apparatus to carry on the living functions. Duges, for example, defined life as the 'special activity of organized bodies.' Beclard said that life was 'organization in action.' Lawrence's idea of life implied that it consisted in the 'assemblage of all the functions or purposes of organized bodies.' And other definitions of a similar nature might be cited to show the extent to which this idea prevailed. Now when we regard some of the lowest of living beings, from either the animal or plant world, we find that organization, or the possession of definite structures and parts, is a feature totally wanting; yet these lower forms live and carry on their living functions as perfectly as the highest animal or plant. A lower animal or plant, consisting of a minute speck of protoplasm or living jelly-like matter, lives, moves, digests food, and reproduces its kind as perfectly, so far as its welfare is concerned, as the highest form. Yet on examining its structure with the microscope no trace of an organ or tissue can be detected in the uniform living protoplasm which composes its entire body. And even in such a state of matters, as exemplified by the Foraminifera (which see), we find this simple protoplasm furnished with the power of forming shells in many instances of exceeding beauty and complexity of outline. Thus no organization is present in such a case, and we therefore conclude, that organization is *not the cause*, but invariably the *result* of life. A living being is organized because it lives; it does not live because it is organized. Life—as seen in the egg or germ-cell—always precedes the appearance and development of organized structures, which latter are simply the manifestation of vital and formative powers. The animal cannot therefore be compared to a machine in its essential nature. The higher animal may resemble the watch or engine: each possessing an intricate mechanism; but the complex mechanism in virtue of which the watch or engine moves and exhibits all its characters is exactly what is wanting in the lower animal. The latter thus carries on all its complicated functions without mechanism or organization, as perfectly, so far as its existence is concerned, as the highest animal, or the complicated watch. The difference between the highest and the lowest animal is therefore merely one of degree and not of kind.

By the term *organic* or *vegetative functions* we are accustomed to denote those functions—*nutrition* and *reproduction*—which are common to animals and plants. The function of *innervation*, or that of the nervous system, being peculiar to animals, is spoken of as the *animal function*, in contradistinction to the organic processes.

ORGANIC ANALYSIS, the process by which the composition of organic bodies or compounds of carbon is ascertained. All carbon compounds, when heated, are decomposed; and if the gases formed by this decomposition are passed over strongly-heated copper oxide, the carbon is burned to carbon dioxide and the hydrogen to water. Carbon dioxide can be absorbed by caustic potash, and water by calcium chloride; on these facts the process of organic analysis is based. A weighed amount of the substance to be analyzed is placed at one end of a glass tube made of very infusible glass: if a solid, the substance may be placed in a small platinum boat; if a liquid, it is contained in a small, thin glass bulb open at one end. The tube is filled with copper oxide, and to the end farthest from the substance to be analyzed a series of weighed tubes are adapted, the first containing calcium chloride, the others caustic potash. The tube is placed in a gas-furnace, and the copper oxide is heated; heat is then applied gradually to the substance, care being taken that the decomposition does not proceed at too rapid a pace, else some of the gases may escape only partially burned. The water is caught in the first tube, the carbon dioxide in the others; from the increase in weight of these tubes the amount of hydrogen and of carbon in the original substance is easily calculated. For estimating nitrogen, chlorine, bromine, and sulphur, in carbon compounds, special methods are required, a description of which cannot well find a place here.

ORGANIC COMPOUNDS. Organic chemistry was formerly defined as the chemistry of substances derived from plants and animals; but as we are now able to produce many, if not most, of these substances artificially, this definition is no longer a good one. Inasmuch as carbon is invariably a constituent of all substances included under organic chemistry, this name has been in great measure replaced by another, namely, 'chemistry of the carbon compounds.' We recognize, therefore, no essential difference between chemical substances of mineral and those of vegetable or animal origin; but for the convenience of study we divide chemical science into two great classes, the first including all the elements except carbon, while the second is devoted to the study of the one element carbon, and its compounds.

ORGANIC RADICALS, the name given to a number of compounds of carbon which act in many bodies as if they were truly elementary substances. These radicals can of course be decomposed; nevertheless in many chemical operations they remain intact, so that we can show the relation existing between many of the carbon compounds by formulating them as compounds of one or other of these radicals; thus the compounds of cyanogen, CN, present many points of analogy with the chlorides, bromides, and iodides. This we show in our notation by such formulæ as KCy, KCl, KBr, and KI, where Cy stands for the group CN. Again, the group CH_3, or methyl, enters into the composition of a number of compounds; thus we talk of methyl hydride, or marsh-gas, $CH_3.H$; methyl chloride, $CH_3.Cl$; methyl alcohol, $CH_3.CHO$; and so on. In these compounds the group CH_3 is regarded as playing the part of an element, and as entering into combination so as to replace one atom of hydrogen. We now know of a great many of these organic radicals; many of them have never been obtained in the free state, nevertheless we feel justified in formulating many series of substances on the supposition that they contain these radicals.

ORGANO-METALLIC BODIES. This name is applied to those substances which contain a metal united directly with an organic radical; thus just as we have ethyl iodide, C_2H_5I, so we have ethyl zinc, $Zn(C_2H_5)_2$, and so on.

ORGANZINE. See SILK.

ORGIES (in Greek, *orgia*), the mystic rites and wild revels celebrated in honour of Bacchus; also the festivals and mysteries of other deities. (See BACCHUS and MYSTERIES.) The term has hence been applied to any scene of riotous mirth and excessive revelry.

ORIEL COLLEGE, Oxford. This college was founded in 1326 by Edward II. on the suggestion of Adam de Brome, his almoner, for a provost and ten fellows. Eight fellowships and several exhibitions have since been added. By an ordinance framed under the statute 17 and 18 Vict. cap. lxxxi., the election to two fellowships is at present suspended. Under the

same ordinance there are ten scholarships tenable for five years, and four exhibitions tenable till the end of the twentieth term from matriculation. The value of each of these scholarships and exhibitions (during residence) is £80 per annum. Candidates for these exhibitions must be deserving persons in need of support at the university; to a scholarship no one is eligible who has attained the age of twenty years, or who, being a member of the university, has exceeded two years from his matriculation.

ORIEL WINDOW, a projecting angular window, usually having three or five sides, and divided by mullions and transoms into different bays and other projections.

ORIENTAL LANGUAGES, the general designation at the present day for the languages of the nations of Asia, as also of the Mohammedan countries of Europe and Africa.

ORIENTATION is the term applied by English ecclesiologists to the deviation from the true east which has been observed to exist in churches which had been supposed to stand for the purpose of certain religious observances exactly east and west. The great majority of such churches are found to incline a little to the north or south.

ORIFLAMME (Latin, *aurum*, gold; *flamma*, a flame), the old royal standard of France, originally the church banner of the abbey of St. Denis, which was presented by the abbot to the lord protector of the convent (formerly the Counts of Vexin and Pontoise) whenever it was necessary to take up arms for the preservation of its rights and possessions. It was a piece of red taffeta (thence the name) fixed on a golden spear, in the form of a banner, and cut into three points, each of which was adorned with a tassel of green silk. When Philip I. afterwards united Vexin to the possessions of the crown, it fell to him to bear the banner as protector of the abbey. It was now carried with the armies, and eventually became the great standard of the kingdom. Since the time of Charles VII. it has never been carried into battle. See Lanzelot, Mémoires de l'Académie des Inscriptions, viii.

ORIGEN, one of the most learned ecclesiastical writers, surnamed, from his untiring diligence *Adamantinos*, was born at Alexandria, A.D. 185, and early instructed by his father in the Christian religion and the sciences. His teachers afterwards were Clement of Alexandria and Ammonius. In his early youth he gave proofs of greatness of soul. When his father was thrown into prison on account of his religion, under the Emperor Severus, Origen exhorted him to suffer martyrdom rather than renounce Christianity. After the martyrdom of his father in 202 he maintained his mother and sister by giving instructions in grammar. At the age of eighteen he was appointed to instruct the believers in Alexandria. Males and females crowded to his lectures. To escape calumny he determined to mutilate himself, and he thought the act was justified by a passage in the New Testament, though afterwards he expressed great sorrow for what he had done. After the death of Septimius Severus in 211 Origen went to Rome, where he gained friends and admirers. After his return, agreeably to the desire of the Bishop Demetrius, he continued his instructions at Alexandria. A popular tumult compelled him to flee to Palestine. He was so highly esteemed by the bishops there that they permitted him to preach in their assemblies. His own bishop, moved with jealousy, recalled him. He was soon after invited to Achaia, which was distracted by various heresies. On his way to Cæsarea, in Palestine, he was consecrated to the office of presbyter by the bishops who were there assembled. This laid the foundation for the persecutions which embittered the remainder of his life. Demetrius maintained that it belonged only to himself to consecrate Origen. He summoned two councils, deprived Origen of his priestly office, prohibited him from teaching in Alexandria, whither he had returned, compelled him to leave the city, and excommunicated him, the principal heresy charged against him being his denial of eternal punishment. This sentence was confirmed at Rome and by most of the other bishops. But the churches of Palestine, Arabia, Phœnicia, and Achaia maintained a connection with Origen, who denied the errors of which he was accused, and went back again to Cæsarea. Theochristus, the bishop there, received him, and intrusted to him the duty of explaining the Holy Scriptures. In the year 231 his persecutor died, and Origen now enjoyed in tranquillity his well-deserved fame. The persecution of the Christians, under Maximin, forced him to remain for two years in concealment. When peace was restored to the church by Gordian, in 237, Origen took advantage of it to travel to Athens. He then went to Arabia, to which the bishops of this province had invited him to refute Bishop Beryllus, who affirmed that the divine nature of Christ did not exist before his human nature. Origen spoke with such eloquence that Beryllus recanted, and thanked him for his instructions. The same bishops called him to a council which they held against certain heretics who maintained that death was common to soul and body. Origen spoke on this subject likewise with such power that he gained them all over to his own opinions. In a new persecution, under the Emperor Decius, Origen was viewed as a pillar of the church, was thrown into prison, and subjected to the most cruel sufferings. Exhausted by this severity he died at Tyre in the year 254.

Few authors have written so much as Origen: few men have been so much esteemed and admired, and yet attacked with such virulence, and persecuted with such severity, both during his life and after his death. He was reproached with having attempted to blend the Christian doctrines with the notions of Plato. Particularly in his book De Principiis, directed against heretics, and now extant only in the fragments of a translation by Rufinus, he presents a system founded on the Platonic philosophy; but he gives his opinions only as a possibility; moreover, the heretics of his own time, as he says himself, corrupted his writings. He has been accused, without reason, of favouring materialism. He expressly opposes those who consider God as having a corporeal nature. Of his works (represented to be 6000), with the exception of the one just mentioned, there are extant only his Exhortation to Martyrdom, commentaries, homilies, and scholia on the Holy Scriptures, of which he may have intended to explain the whole. We still have a large number of them; but they are, in general, nothing more than free translations. He made a general application of the figurative or allegorical explanations of the Jews, and rejected the literal meaning, which he regarded as the mere external part of the former. Besides these exegetical works he distinguished himself by his critical talent in his Hexapla, of which an edition was published by Montfaucon, and afterwards by Chr. Fr. Bahrdt. His work against Celsus is considered as the most complete and convincing defence of Christianity of which antiquity can boast. His works, complete in four volumes folio, were published by De La Rue (Paris, 1733–59). A translation of his works into English has been published by T. & T. Clark (Edinburgh, 1868–72). There has been much contention about the orthodoxy of Origen. In the fourth century the Arians appealed to his authority to confirm the truth of their doctrines. The most learned and

the most celebrated fathers have been found both among his friends and his opponents.

ORIGINAL SIN is the term employed by theological writers to denote the doctrine which maintains the complete corruption of the reason and the will in all the descendants of Adam through the fall, and the consequent inability of man in his natural state either to know or to love God, or indeed do anything that is good, thus rendering himself liable to death temporal and death eternal. The doctrine is founded on such passages as Gen. viii. 21; Gal. iii. 22; v. 17; Rom. iii. 23 *et seq.*; v. 12; viii. 5; though some maintain that these passages do not give any countenance to the doctrine. The Greek fathers held that a perverted will and sin are coordinate with the human race, and that death has dominion over it by reason of its origination from Adam after the fall. Justyn Martyr says that the entire race of men from Adam had become subject to death and the transgression of the serpent, as well as guilty of individual sins. Irenæus says that at the fall man lost the image and likeness of God in which he was created, and that the whole race having become transgressors in Adam, became subject to death, and were led captive by the devil. Athanasius and Cyril of Jerusalem held similar views. Origen describes man as born with depraved appetites, but credits him with having occasional glimpses of divine and god-like things. Chrysostom says that 'a whole swarm of passions were introduced by Adam's sin, as well as death. Human nature has been driven wild by them as a restive horse.' Again he says, 'Adam's sin depraved man's nature and brought in concupiscence, that, without being itself sin, leadeth, when unrestrained, straight to evil.'

In the Latin Church the doctrine was more fully developed than in the Greek Church. Tertullian, in accordance with his doctrine of Traducianism, which holds that the soul as well as the body is generated by the parents, asserted that sin and death were alike propagated from Adam; he accordingly held an *originis vitium*, but without regarding it as actual sin or denying to man the possibility of goodness. In this view he was followed by Cyprian, Hilary of Poitiers, and Ambrose. Augustine, however, asserted, in opposition to the Pelagians, as the Catholic view of the church, the doctrine defined above. 'Death was brought into the world by Adam's sin; man's free-will, the reflex of the divine will, was lost to him by the fall as regards good; there remained only spontaneity, the negation of outward constraint, and free-will as regards evil. Men differ in their individual character solely by their varying grades of evil.' The original taint of our nature and liability to death is communicated from father to son by generation. Augustine procured the condemnation of his opponents the Pelagians (which see) in several councils, although the Councils of Jerusalem and Diospolis in 415 decided in their favour. Pelagius had asserted that no change whatever had been brought about by the fall, that death was a part of man's original constitution, and that all men could render faultless obedience to the law of God if they wished. After the condemnation of Pelagianism it again sprung up in a modified form, and was known by the name of semi-Pelagianism. According to this view death and a taint of corruption were inherited from Adam as a disease might be, but man still retained a power for good without the aid of divine grace. This doctrine obtained much support in the church. In the ninth century the controversy regarding original sin was again revived by John Scotus Erigena, who held the infection of man's nature to be the result of its original constitution. Among the schoolmen Anselm of Canterbury, Peter Lombard, and Thomas Aquinas took the lead in the controversy. Anselm regarded original sin as a bodily taint communicated by propagation, and which defiled the soul by reason of its close connection with the body.

The reformers of the sixteenth century upheld the Augustinian view of original sin in opposition to the Roman Catholics, who at the Council of Trent gave their adhesion to the semi-Pelagian view of the doctrine. The Lutheran and the Reformed Churches both held similar views regarding original sin, following Calvin rather than Zwingli, who looked upon it as an evil or disease, and only as a sin when a commandment was thereby transgressed. The Arminians and Socinians, on the other hand, discountenanced the ecclesiastical view of the doctrine. While the Protestant Church maintained that Jesus alone was absolutely free from original sin, the Roman Catholic Church extended this attribute to the Virgin Mary as well. Uniform adhesion to the Augustinian dogma on the part of the reformers was by no means the case. From Luther's dispute with Erasmus, who would only admit a weakness of the free-will and not its destruction, up to the present time the doctrine has been variously defended and attacked, philosophers as well as theologians taking part in the controversy. Kant showed the moral signification of the doctrine, and represented original sin as an inherent tendency in man's nature to evil. Rationalism, on the other hand, taught with Pelagius that it was only a weakness of man's nature with regard to knowledge and his power for good. According to Hegel original sin is nothing else than the necessary finitude and limitation of our nature. In recent times orthodox theologians, such as Olshausen, Hengstenberg, and others, have stood up for the Augustinian doctrine, while those of the more liberal school have modified it in various ways. See Müller's Christliche Lehre von der Sünde; Gieseler's Dogmengeschichte, sec. 72.

ORIGIN OF SPECIES. See SPECIES.

ORIHUELA, a town of Spain, Alicante, in a fertile plain on the Segura, 30 miles south-west of the town of Alicante. It is a long straggling place, entered by several gates, one of which is a magnificent and lofty arch crowned by a colossal statue. The principal public buildings are the cathedral, a Gothic structure both small and heavy; three parish churches, one of them containing a remarkably beautiful chapel; a court-house, having a very valuable series of archives; a modern and very elegant episcopal palace, a university, a foundling and other hospitals. The chief manufactures are hats, soap, leather, silk goods, &c., and there are numerous silk, corn, and oil mills. Orihuela figures much in the early Spanish wars. Pop. 20,929.

ORILLON, in fortification, is a small rounding of earth faced with a wall, raised on the shoulders of those bastions that have casemates, to cover the cannon in the re-entering angle, and prevent their being dismounted by the enemy.

ORINOCO, a river of South America, one of the largest in the world. It rises in the Sierra del Parima, near lat. 3° 40′ N.; lon. 64° W. Its whole length, including its windings, is about 1500 miles. It has a very circuitous course, and flows into the Atlantic opposite to the Island of Trinidad. The numerous channels by which the Orinoco latterly finds its way to the sea begin to branch off from the main stream upwards of 100 miles from the coast. The principal mouth, 6 leagues wide, is south-east of Trinidad, in lon. 59° 50′ W.; lat. 8° 30′ N. The Orinoco is connected with the Rio Negro, a tributary of the Amazon, by the Cassiquiari, a natural canal joining the two rivers, and it receives the waters of many large

rivers, among which are the united streams of the Atabapo and Guaviare, the Meta, Apure, Arauca, Caura, and Caroni. Three of these are larger than the Danube. At 200 leagues from the ocean it is from 5000 to 6000 yards wide; at Angostura or Ciudad Bolivar, 7500 yards; and in March, when the waters are lowest, it is 65 fathoms deep. During the rainy season it inundates the immense plains through which it flows, the inundation extending during the highest floods from 80 to 90 miles on each side, presenting to the eye a boundless expanse of waters. On the banks of the Orinoco the magnificence of the scenery is beyond description. Forests of the greatest extent are filled with aromatic trees, which diffuse the most delightful odour; birds of the most various and beautiful plumage abound, and hordes of monkeys follow the astonished traveller. Passing these forests enormous plains extend their verdant surfaces farther than the eye can reach. Two remarkable rapids occur in the upper parts of the Orinoco, called the Atures and Maypures, or Apures, the one in lat. 5° 8′ N., the other about 36 miles lower down. These rapids consist of a countless number of little cascades succeeding each other like steps, and where numerous islands and rocks so restrict the bed of the river that out of a breadth of 8000 feet there only remains an open channel of 20 feet. From these rapids the river is navigable to its mouth.

ORIOLE, a name popularly applied to two groups of Birds, the one group included in the Conirostral section of the order Insessores or Perching Birds, the other classified with the Dentirostral section of the same order. The American Orioles are thus Conirostral Perchers, nearly allied to the Starlings, and forming the type of the sub-family Icterinæ of the family Icteridæ (which see). In this sub-family the wings are long and of pointed shape; the tail is conical or wedge-shaped; and the toes are of moderate size. The beak is sharp at the apex. These birds appear to be gregarious in habits. They spend the summer in the United States, but winter in the southern portions of the continent. Tropical America forms the head-quarters of the group. Their nest-building habits are of peculiar kind, most of these birds constructing habitations of complicated kind, consisting of hemp or flax fibres woven into a firm fabric which is securely fixed amid the branches of trees, and protected from the rain by coverings of various kinds. The males are most brilliantly coloured; the colours being most vivid in the spring, and assuming a more sombre tint in winter. The 'Baltimore Bird,' or Oriole, or Golden Robin (*Icterus* or *Hyphantes Baltimore*) is a familiar species of this group. It constructs an ingeniously woven nest, and is said to steal threads of silk or other material for the formation of its abode. This bird is coloured black and orange, and the popular name of 'fire-bird' has been given to it from its shining appearance as it flies swiftly through the trees. The 'Orchard Oriole' (*Icterus spurius*) constructs a nest of grass, and is distributed very generally over the United States. The male birds of this species have the body coloured chestnut, whilst the head, neck, wings, and tail are black. The female and young are olive-green in colour, with dusky wings and tail.

The Orioles proper, or those of the Old World, included in the Dentirostres, form the sub-family *Oriolinæ*, and are nearly related to the Thrushes. The bill in these birds is stout, straight, having the sides of the upper mandible sloping near the base. The gape is provided with small bristles. The tail is straight and rounded at the tip; and the wings are elongated and powerful. The tarsi are covered by seven scales anteriorly, and are of short conformation. The toes terminate in strong sharp nails of curved shape, the front toes being united at their bases. The Orioles live in pairs, and inhabit woods; and the nests, like those of the American Orioles, are generally constructed with much ingenuity. The dietary consists chiefly of fruits, seeds, and insects. The males are most brightly coloured, the general hue being a bright yellow or golden colour. The Golden Oriole (*Oriolus Galbula*) is the typical form, and the only European member of the group. The wings and tail of the males are black, and contrast powerfully with the golden colour of the body. The female is coloured greenish-yellow on the upper and whitish on the under parts, whilst the wings and tail are brown. In size it resembles a common thrush or blackbird. It chiefly inhabits Southern Europe, but is occasionally found in Britain. It arrives in Europe in spring, its dietary being insectivorous at first, and consisting later on chiefly of fruits. The eggs number five, and are coloured white with black spots. The nest is round and flattened in form, but it is also said to build a pendant nest, like its neighbours of the tropics. The song of the Golden Oriole is of a loud character, and has been described as imitating the sound of the flute in general timbre; whilst it has been also alleged to resemble the musical pronunciation of the word *puhlo* (Bechstein). The Indian Golden Oriole or Mango Bird (*O. Kundoo*) and the Black-headed Oriole of Bengal (*O. melanocephalus*) are also familiar species. The Regent Bird or King Honey-eater of Australia (*Sericulus chrysocephalus*) has the tip of the tongue provided, like that of the true 'Honey-eaters,' with bristle-like filaments. The male is brilliantly coloured of a deep black and glossy yellow, the female being of dingy appearance. These birds feed on insects and fruits. (Pl. CXLIV.–CXLV.)

ORION, a hero of Greek mythology, son of Hyrieus, of Hyria in Boeotia. According to Homer he was a beautiful youth, of whose charms Eōs became enamoured. The gods were jealous of her love, and Artemis slew him with her arrows in the Island of Ortygia. According to other writers he was a king and a great hunter, and, as Homer says, continued even in the lower world to hunt in a large meadow the animals he had killed upon earth. He was of such gigantic size that when standing in the middle of the sea the water only reached his shoulders. He died of the sting of a scorpion. Others say that Artemis loved Orion so passionately that she wished him for her husband. This condescension so offended her brother Apollo that he resolved on the death of the insolent mortal. When Orion, therefore, went into the sea, and his head alone was visible, Apollo asked Artemis to try whether she could hit with her arrows that dark spot visible above the waters. The goddess shot the fatal arrow, which pierced the head of her lover. She was unconscious of her mistake until the waves bore his body to the shore. The hero after his death was placed with his hounds in the heavens as a constellation, which bears his name.

ORION, one of Ptolemy's constellations and the most marked in the heavens. It is divided by the equator into two nearly equal portions. When all its bright stars are known, many of the surrounding ones may readily be found by alignments. Betelgeux and Rigel are its two brightest objects; the first is a remarkable variable star, the second a fine double star. The stars ι and θ are nebulous. See NEBULA.

ORISSA, a maritime province, Hindustan, lying on the Bay of Bengal, between Bardwan and the Madras Presidency, and now included in the lower provinces of the Presidency of Bengal. It is about 200 miles long and half as much broad, and includes the three districts of Balasore, Cattack, and Puri.

and a number of tributary states. The surface along the shore is in general low and sandy, and in the interior wild and rugged, consisting of steep precipices, dense forests, pathless deserts, and pestilential swamps. The inhabitants are composed chiefly of Oorias, the conquerors of the country; and of wild hill tribes. The largest river is the Mahánadi, which divides into a number of mouths in the territory, and whose floods have frequently desolated considerable tracts of country. The chief towns are Cattack, Puri or Juggernauth, and Balasore. In the dry season of 1865–66 about a fourth of the population is estimated to have perished through famine. Pop. in 1881, 3,370,735.

ORISTANO, a town in the Island of Sardinia, near the left bank of the Tirsi, 30 miles N.N.W. of Cagliari. It has walls flanked with towers, a cathedral, Episcopal palace, diocesan seminary, Franciscan monastery, and hospital. The manufactures consist of hardware, cutlery, and agricultural implements; and the trade is chiefly in corn, wine, oil, cheese, and cattle. Pop. 6041.

ORKNEY ISLANDS (French and Latin, *Orcades;* Italian, *Orcadi*), a group lying off the northern coast of Scotland, and separated from it by a channel called the Pentland Firth, about 6 to 8 miles broad. They extend from lat. 58° 42′ to 59° 23′ N.; lon. 2° 22′ and 3° 25′ W.; aggregate area, 375 square miles, or 240,476 acres, of which about 112,000 are under culture. There are in all about thirteen islands of considerable size, with a number of smaller dispersed over the archipelago. Among the larger the principal are Pomona or Mainland, the largest of the group; Hoy, South and North Ronaldshay, Westray, Sanday, Eday, Stronsay, Ronsay, and Shapensay. Of the whole about twenty-eight are usually inhabited, although about five or six of them do not count a dozen inhabitants each. Hoy is the only island of the group that can be called mountainous, and here the highest elevation is but 1600 feet. None of the rest have hills of any considerable height. Nearly all the larger islands are of exceedingly irregular form, being in many instances so worn and penetrated by the sea as to present rather a series of crooked and shapeless peninsulas, projecting in all directions, than a group of compact insular bodies. In some cases the coasts of these islands are flat and sandy; in others bold and rocky. The precipices are highest on the western side, reaching in the Island of Hoy the height of 1000 feet perpendicular. With exception of a small granitic district near Stromness, the rocks belong to the Old Red Sandstone formation. The alluvial deposits are neither extensive nor interesting. There is abundance of clay, and in most parishes of peat-moss; in many places marl, and in some bog-iron ore. In the peat-mosses roots of large trees, hazel nuts, deers' horns, &c., are frequently found, showing that forests formerly existed there, although at present the climate is eminently unfavourable to the growth of trees. There are no streams deserving the name of rivers in any of the islands, but springs of good water are abundant; and there are many lakes, the largest of which, Stennis or Stenhouse, in the Mainland, is 14 miles in circumference. Chalybeate springs are not uncommon. The climate is moist, but not cold. In winter storms of sleet and rain are frequent, but in summer the weather is generally fine and steady. Agriculture has made considerable progress within the last thirty years. In 1883 the total acreage under corn crops was 38,459 acres, under green crops 17,852; under grass and clover in rotation and permanent pasture, 54,806. The common breeds of sheep, cattle, and horses were small, but since the introduction of good breeds from the south about twenty years ago, have become large and valuable. Rabbits and poultry are numerous. The herring and cod fisheries compensate in some parts the absence or defective development of other resources, and large numbers of lobsters are annually sent to London. The principal manufacture carried on is that of hosiery, which is made by the females. The building of boats, and making of sails, nets, and cordage, may also be named amongst the manufactures. The chief town is Kirkwall, which has regular steam communication with Aberdeen and Leith. Pop. in 1881, 32,044.

The early accounts of these islands are involved in many fables. Mention is made of them by several ancient geographers as well as classical writers, such as Pliny the elder, Mela, Solinus, and others, but nothing is known definitely of the earlier inhabitants. It is probable that the Picts possessed the islands until the subversion of the Pictish Kingdom in Scotland by Kenneth II. They continued annexed to the Scottish monarchy until 1099, when they were assigned by King Donald Bane to the King of Norway for the assistance which Donald had received from that king in his usurpation. They remained in possession of the Norwegians until the middle of the thirteenth century, when Magnus, king of Norway, transferred them to Alexander, king of Scotland; but the islands were of small advantage to the Scots, as the Norwegians continued to assert their right of sovereignty, and often possessed them until the year 1470, when James III. of Scotland married Margaret, daughter of the King of Norway, with whom they again passed to the crown of Scotland, in lieu of dowry, and upon the birth of her son they were finally ceded. Not, however, till the marriage of James VI. with the Princess Anne of Denmark did the Danish government ultimately abandon all their former pretensions. The superiority of the Orkneys was dismembered from the crown by the Union Parliament, and granted for a certain annual consideration to the Earl of Morton, whom Queen Anne also appointed hereditary steward and justiciary. When heritable jurisdictions were abolished in 1748 the appointment of the stewardship reverted to the crown; but the Earl of Morton possessing the patronage of the stewartry, he long retained the posts of steward and sheriff. The superiority was afterwards purchased from the earl by Sir Lawrence Dundas for £60,000, and it still continues in the family of his descendant, the Earl of Zetland. The Orkney and Shetland Islands form together one county.

ORLANDO FURIOSO. See ARIOSTO.

ORLANDO INNAMORATO. See BOIARDO.

ORLÉANAIS, before the revolution a fertile province of France. The Loire passes through and divides it. Orléans, which gave name to the province, was the capital. It now forms departments Loir-et-Cher and Loiret, and parts of Eure-et-Loir, Nièvre, Seine-et-Oise, Sarthe, Indre-et-Loire, and Cher.

ORLÉANS, a city of France, capital of the department of the Loiret, is situated on the right bank of the Loire, 68 miles south-west of Paris. A magnificent bridge of nine arches connects it with the populous faubourg of St. Marceau. The houses are well-built, but the streets in general are narrow and crooked. It has some handsome public squares, a Gothic cathedral; two hôtels-de-ville; the Palais de Justice; the Musée, containing a curious collection of local antiquities; the theatre, and other edifices worthy of notice. The manufactures and trade of the place are still considerable, but have much declined; there are several worsted and cotton mills, numerous sugar-refineries, vinegar works, breweries, and manufactures of hosiery, ironmongery, pottery,

&c. Philip of Valois erected Orleans into a duchy and peerage in favour of his son, and Orleans has since continued to give the title of duke to a prince of the blood-royal. Charles VI. conferred it on his younger brother, who became the founder of the Valois-Orléans line. This line having become extinct, the title was borne by the third son of Henry IV., Gaston, who left no male heirs. Louis XIV. conferred it on his brother, the founder of the present line of Bourbon-Orléans. (See the succeeding article.) Philip the Fair instituted a university here in 1312, which formerly had great celebrity. In 1428 the city sustained a siege against the English, and was relieved by the Maid of Orleans (see JOAN OF ARC), whose statue in bronze stands in one of the public squares. It was taken and retaken more than once in the Franco-German war in the latter part of 1870. Pop. in 1881, 57,264.

ORLEANS. Two houses of this name have occupied the throne of France:—

1. On the death of Charles VIII. without issue in 1498, Louis, duke of Orleans, great-grandson of their common ancestor Charles V., and grandson of the first Duke of Orleans, being the nearest heir, ascended the throne under the title of Louis XII. Henry III. (died 1589) was the last sovereign of this house, or the *Valois-Orléans* branch. See FRANCE—History.

2. The house of *Bourbon-Orléans* is descended from Philip, duke of Orleans, son of Louis XIII. and younger brother of Louis XIV. His son Philip, duke of Orleans, was regent of France during the minority of Louis XV. His grandson Louis-Philippe Joseph, who made himself notorious during the French revolution, and assumed the surname of Égalité, married Louisa, daughter of the Duke of Penthièvre (son of the Count of Toulouse, a natural son of Louis XIV.), and was beheaded in 1793. Louis Philip, duke of Chartres, afterwards King of the French, was his son.

ORLEANS, GASTON JEAN BAPTISTE DE FRANCE, DUKE OF, third son of Henry IV. and Mary of Medici, born 1608, was involved, without either glory or success, in all the troubles that agitated the reign of his brother Louis XIII. and the minority of Louis XIV. His early education was miserable, and was the cause of the feebleness of character which he displayed through life, although he had received from nature much more of his father's spirit than Louis XIII. The jealousy which the latter, particularly before his wife, Ann of Austria, had borne him children, entertained of his brother, was the first cause of that difference between them which the duke's vindictive temper never allowed to be permanently healed. By his first marriage, with Mary of Bourbon, heiress of the house of Montpensier, he had a daughter, the author of some interesting memoirs. After her death he was desirous of contracting a marriage with Marie de Mantoue, but was opposed by the king and queen. Irritated by this opposition he retired to his duchy, afterwards passing into Lorraine, where in 1631 he secretly married Margaret, a sister of the Duke of Lorraine. His armaments, his intrigues with the queen-mother, his vain menaces, and his negotiations with foreign courts, were unavailing against Richelieu, who was more powerful than the royal family itself, and had already succeeded in removing a number of the duke's friends. (See RICHELIEU and LOUIS XIII.) The duke was obliged to submit, and in his political conduct and life now displayed that singular vacillation which led the Cardinal de Retz to say of him that he engaged in everything because he wanted firmness to refuse those who led him, and that he always came off with disgrace because he wanted courage to persevere. New disputes broke out between him and the king. His marriage, which was now known to the king, was, in 1634, at the instigation of the latter, declared invalid by the parliament of Paris. This decision gave rise to a war of pens between the jurists and the theologians. The duke continued to take a part in all the troubles, and the validity of his marriage was not acknowledged until 1643, after the death of Louis XIII. During the disturbances of the Fronde the vacillating enemy of Richelieu could not be a steady friend of Mazarin. He joined the coadjutor De Retz, the soul of the Fronde, who soon saw through the character of his fickle and feeble confederate. After the termination of the troubles (1648) the duke was banished to Blois, where he died in 1660. See the Mémoires of his daughter, above mentioned.

ORLEANS, LOUIS PHILIPPE JOSEPH, DUKE OF (*Égalité*), great-grandson of the regent, was born in 1747; married in 1769 the daughter of the Duke of Penthièvre, grand-admiral of France; had, till 1752, the title of Duke of Montpensier, and till the death of his father in 1785, that of Duke of Chartres. He was notorious at once for his extreme dissoluteness of manners, his excessive debaucheries, and the extreme, though vacillating political conduct by which he courted popularity. His opposition to the court began in 1771, when he opposed the *coup d'état* of Maupeou against the court. In 1778 he was refused the post of grand-admiral, to which he had a hereditary title. From this time he became the rallying point of the enemies of the court. For the part he took in the Assembly of Notables in 1787 he was exiled. In 1789 he was one of the nobles who joined the Tiers État. He became a member of the Club of Jacobins, and renounced his titles and rank, but in the constituent assembly he generally voted with the constitutional party. In 1792, after an unsuccessful negotiation with the court for a reconciliation, he threw himself without reserve into the arms of the revolutionary party, was elected a Parisian deputy to the National Convention, and took the name of Philippe Égalité, suggested by Manuel. He took his seat in the *Mountain*, voted for the death without delay of Louis XVI., a compliance which excited the contempt even of the Republicans. It did not save him from being arrested as a Bourbon, in April, 1793. His repeated protestations of the genuineness of his citizenship were unheeded, and after six months' detention he was condemned and beheaded, 6th November, 1793.

ORLEANS, MAID OF. See JOAN OF ARC.

ORLEANS, NEW. See NEW ORLEANS.

ORLEANS, PHILIPPE, DUKE OF, only brother of Louis XIV., and founder of the house of Bourbon-Orléans, which for a short time held the throne of France, was born in 1640. Mazarin, who superintended the education of the two princes, had adopted the plan of the eastern courts, to render one of them manly and the other effeminate. 'Why,' said he to Lamothe le Vayer, the tutor of Philippe, 'why do you wish to make the king's brother an able man? If he is more learned than the king he will no longer know what blind obedience is.' While Louis was early accustomed to play the king, his mother used to show the delicate Philippe to the courtiers in petticoats. In his twenty-first year he married Henrietta of England, sister of Charles II. The great esteem which the king showed for this princess excited the jealousy of his brother. Soon after her return from England, whither the king had sent her to detach her brother from the triple alliance, she died suddenly, and her death was attributed to poison, to the administration of which the duke was suspected of being accessory. His jealousy seems not to have been unfounded, according to the accounts contained in the letters of his second wife, Elizabeth Charlotte, in which the

charge of his being an accomplice in the poisoning is repelled. (See the Mémoires sur la Cour de Louis XIV. et sur la Régence, extracted from her correspondence; Paris, 1822.) The second marriage of the duke with the Princess Elizabeth (1671) was arranged by Louis to secure the neutrality of the elector palatine in the approaching war against Holland. In this war the duke distinguished himself, and the soldiers said of him that he was more afraid of the sun than of powder and ball. But the feebleness of his character displayed itself in all his tastes. Dress, masquerades, court pageants, were his great delights; and his wife, in the Mémoires above mentioned, relates some amusing stories of his superstition. He died in 1701.

ORLEANS, PHILIPPE, DUKE OF, Regent of France, son of Philippe, duke of Orleans, and the Princess Palatine Elizabeth, was born 2d August, 1674. Till the death of his father he had the title of Duke of Chartres. He had numerous tutors, who all died before his majority. He consequently fell under the influence of his sub-præceptor, the Abbé (afterwards Cardinal) Dubois, who continued his confidant and adviser through life. Under his influence he became confirmed in debaucheries, for which the court of Louis XIV. already afforded sufficient authority and example. Dubois, though unscrupulous, was a man of ability, and his pupil appears to have possessed no common share of capacity, showing great aptitude in his literary, scientific, and military studies, while in the conduct of his government he afterwards showed himself an able politician. He early made his *début* in the career of arms, assisting in his seventeenth year at the siege of Mons (1691), at Namur and Steenkirk (1692), and at Neerwinden (1693) he served under the Duke of Luxembourg, at the last of which he greatly distinguished himself. His rising military renown awoke the jealousy of the king, who recalled him, and would not permit him to join the army in 1694. In 1692 he had married, by the advice of Dubois, in accordance with the king's wish, Mdlle. de Blois, the legitimated daughter of Louis. During his enforced retirement he plunged into debauchery, and seemed disposed to indulge his disposition for ease until the omission of his branch of the family in the testament of Charles II. of Spain roused his attention to politics. He then began to devote his attention actively to military affairs. In 1706, when affairs were going badly for France, Louis was induced to give him the command of the army of Italy, but he was only nominally trusted, and overruled by Marsin and defeated by Eugene, he was compelled to return to France. This disaster was too manifestly due to divided counsels to impede his military career, and in the following year the hazardous experiment was made of appointing him to succeed the Duke of Berwick in Spain. He arrived just after that great commander had gained the victory of Almanza, and in that and the following campaign he followed up that decisive success in a manner which did not deprive it of any of its importance. Having in these campaigns completed the subjugation of Spain, he arrived at Madrid, where he began to concern himself with politics. His intrigues, which in this capital were supposed to aim at the crown, again aroused the jealousy of Louis. He was recalled, his friends were imprisoned, and he was compelled to sign a renunciation of his pretensions to the Spanish crown. With this demand he readily complied. In this second retreat he added to his former pursuits that of alchemy. When in 1711–12 the dauphin, the Duke and Duchess of Burgundy, and their eldest son, all died in rapid succession, this pursuit, together with the supposed interest of Philip, roused the suspicion that they had been poisoned at his instigation. The king, although coldly disposed to his nephew, does not appear to have believed this rumour, but it obtained almost universal credence in Paris. It has since been generally held to be entirely without foundation. However, the intrigues of the court, especially of Madame de Maintenon and the king's illegitimate children, induced Louis to alter his testament, appointing a council of regency, of which the Duke of Orleans was only to be the nominal head, and intrusting the charge of the royal household to the Duke of Maine.

On the death of the king (1st September, 1715) Philip had no difficulty in getting this testament cancelled by the parliament. He commenced his government by an entire reversal of the policy of Louis XIV. He restored the grandees to power, revoked proceedings against the Jansenists and Protestants, and was only prevented by the advice of his councillors from cancelling the revocation of the Edict of Nantes. He also cultivated the alliance of England and the other recent enemies of France, and when Philip V. had entered into an intrigue with the Duke of Maine against him, he joined these powers in a war with Spain (quadruple alliance). It was brought to a successful termination by the Duke of Berwick (1719–20). On acceding to power the regent found France ruined by the wars and extravagance of Louis, and the finances in extreme disorder. He endeavoured to improve matters by retrenchment and the cultivation of peace, but finding these remedies inadequate, he listened to the scheme of a Scotch financial adventurer, Law, for the introduction of a paper currency. This scheme, which he pursued with reckless extravagance, dismissing his finance minister for opposing it, brought the nation to the verge of bankruptcy.

The court of the regent was formed of nobles notorious for the dissoluteness of their manners, and his own example was perhaps the worst in the court. He is even said to have lived in incest with his daughters; and in regard to the eldest, the Duchess of Berry, the charge seems to be too well founded. Father and daughters engaged in common orgies, in which their unbridled intoxication alarmed their guests. He resigned the government to Louis XV. on 13th February, 1723. On the death of Dubois, who continued in office, he was invited to assume the premiership, but he died a few months afterwards, worn out by the excess of his pleasures, 2d December, 1723.

ORLOFF, a Russian noble family.—GREGORY ORLOFF, born 1734, was one of five brothers, who lived a dissipated life. After his fortune was ruined he supported himself by gambling and other arts. He served in the Seven Years' war, and when Count Schwerin was taken prisoner carried him to St. Petersburg. The Grand-princess Catharine, who had just lost her favourite Poniatowski, fell in love with him. He and his brothers assisted her much in the revolution, by which she was declared empress, and her husband, the Emperor Peter III., deprived of life. Orloff soon attained the highest dignities, was allowed to wear the picture of the empress in his button-hole, and became enormously rich. But Orloff was rude and inconsiderate, so that, after some time, the empress wished to rid herself of him. He was sent to Moscow to take measures against the plague, and when he returned was represented on a medal and triumphal arch in the character of Curtius. He was then sent to Fockshani, in Walachia, to attend a conference with the Turks, whom, however, he offended by his overbearing character; and the object of the meeting was lost. The empress now sent him into a sort of banishment, ordering him to remain at one of her castles, to be chosen by himself.

He went to Zarskoe-Selo. In 1772, however, she became reconciled to him. She gave him a magnificent palace, and he gave her, in return, the celebrated Orloff diamond. He now travelled, married, and seemed to live happily. Potemkin at this time had become the lover of the empress. Orloff died in 1783, after having been for some time subject to periodical attacks of insanity.—ALEXIS, his brother, surnamed from a wound received in a tavern-fight *le Balafré*, born 1737, showed, during the revolution in 1762, great courage. Disguised as a coachman he drove the empress from Peterhoff in a mean carriage. He was one of the murderers of Peter III.; rose soon to high dignities in the army; and in 1768 was made admiral of the Russian fleet in the Archipelago, with unlimited power against the Turks, whom he defeated off Tschesme, for which exploit he was called *Tschesmenskoi*. In Leghorn he betrayed the daughter of Elizabeth, whom he had encouraged to aspire to the throne, and had her carried to St. Petersburg, where she was put to death. When he returned he was brilliantly received. When Paul I. ascended the throne he and Bariatinski, the only survivors of the reputed murderers of Peter III., were obliged to attend the removal of the body of the murdered emperor from the convent of Alexander Newski to the fortress, during which ceremony they had to bear the corners of the pall. He remained ever after in disgrace, and died in 1808.—ALEXIS FEDOROVITCH, prince, a descendant of the same family, born in 1787. He served in the French wars from 1805 to 1814. In 1825 he gained the favour of Nicholas I. by assisting to suppress the revolt of the guards on the accession of the emperor. He received the command of a division of cavalry, at the head of which he served in the Turkish campaign of 1828. He acted as plenipotentiary in the negotiation of the Peace of Adrianople (1829). He was afterwards appointed ambassador-extraordinary to Constantinople. He assisted in 1831 in suppressing the insurrection of the Poles. In 1833 he concluded with the sultan the Treaty of Unkiar-Skelessi, giving Russia the key of the Dardanelles. In 1844 he was appointed chief of the gendarmes and secret police. He was the confidential friend of the emperor, whom he accompanied on his journeys. He died 20th May, 1861.

ORLOP DECK, the lowest deck, consisting of a platform laid over the beams in the hold of a ship of war, whereon the cables were usually coiled, and containing also some cabins as well as the chief storerooms. In trading vessels it is often a temporary deck.

ORME'S HEAD, GREAT, a projecting headland, formed of limestone rock, situated at the north-east corner of the county of Carnarvon, Wales, and at the mouth of the river Conway. The Great Orme's Head lies north-west of the fashionable watering-place of Llandudno, situated in a fine bay between it and Little Orme's Head. It rises boldly and abruptly on a narrow terminal ledge of land, and is surrounded nearly on all sides by the sea, overlooking the Irish Channel on the north, and the Bay of Beaumaris on the south. It is surmounted by a lighthouse.

ORMOLU (French, *or moulu*) is in English frequently applied to a metal compounded of copper and zinc (mosaic gold), nearly resembling brass, but having a colour more like that of gold. In French *or moulu* signifies a paste of gold and mercury used for gilding, and the colour imparted to a surface by that paste.

ORMOND, DUKE OF. See BUTLER (JAMES).

ORMSKIRK, a town, Lancashire, 13 miles N.N.E. of Liverpool, near the Leeds and Liverpool Canal, and a station on a branch of the Lancashire and Yorkshire Railway. Its chief occupations are brewing and ropemaking. It is also celebrated for baskets and ginger-bread. There are large collieries in the neighbourhood. Pop. in 1881, 6651.

ORMUZ, or HORMUZ, an island in the Persian Gulf, on the north side, near its entrance, about 15 miles in circumference. It has a rugged appearance, is entirely destitute of vegetation, has several of the high peaks white from an incrustation of salt, and abounds in iron, copper-ore, and rock-salt. Ormuz was once the emporium of all the riches of India, the receptacle for the gems of Samarkand and Bokhara, and for the manufactures of Europe and Asia. During its prosperity the Portuguese had possession of it, and ships from all parts of the world frequented it; but it has long since been quite neglected. The town of Ormuz stood on a plain on the north side of the island; though now only a few scattered ruins, it once contained 4000 houses.

ORMUZD (*Ahurmazd*), in the Persian mythology the name of the supreme deity of the ancient Persians. According to the doctrine of Zoroaster he was the lord of the universe and the creator of earthly and spiritual life; the source of light, wisdom, and intellect, and the giver of all good. He rewards the good and punishes the wicked. He is not self-existent, but has sprung from Zarvan-Akarana (infinite and uncreated time). Ormuzd contains within himself the opposite principles of good and evil. These three principles Zarvan-Akarana, Ormuzd, and Ahriman (the spirit of evil) were ultimately separated by the Magi into distinct individualities. See ZOROASTER.

ORNE, a department, France, bounded on the north by Calvados, north-east by Eure, east by Eure-et-Loir, south by the departments of Sarthe and Mayenne, and west by Manche; area, 2353 square miles, of which about three-fifths are arable and one-fifth meadow. The surface is traversed by a lofty ridge, with ramifications inclosing numerous verdant and well-watered valleys. The streams, none of which are navigable, belong partly to the basin of the English Channel and partly to that of the Loire. Besides the ordinary cereals hemp and fruit are extensively cultivated. The pastures are well adapted both for rearing young stock and feeding. The breed of Norman horses is here maintained in great purity. Iron, the only metal of importance, supplies several blast-furnaces, and is also manufactured to some extent; porcelain clay also, of excellent quality, is abundant, and has led to the erection of numerous potteries. The chief manufactures are cotton and linen cloths. Alençon is the capital; other towns are Argentan, La Ferté-Macé, and Flers. The department is divided into four arrondissements, thirty-six cantons, and 511 communes. Pop. in 1881, 376,126.

ORNITHODELPHIA, the name giving by De Blainville in his system of Mammalian classification to the sub-class of Mammals represented by the single order Monotremata, including the Ornithorhynchus and Echidna. These forms, confined to Australia and Tasmania, are collectively distinguished by the fact that the generative organs closely approximate to the type of structure seen in birds—and hence the name *Ornithodelphia*—from Greek, *ornithos*, a bird; *delphus*, womb. The oviducts do not unite to form a single uterus or womb, but each oviduct continues separate from its neighbour throughout its entire extent; and each opens, not into a vagina, but into a 'cloaca,' or common cavity, which also receives the rectum and the ureters. The testes are abdominal, and there is no scrotum. No external ear exists. The mammary glands are destitute of nipples. The young are not connected before birth with the mother by a placenta or 'after-birth.' The angle of the lower jaw

is not inflected. No 'pouch' exists, but the marsupial bones are present. See MAMMALIA, ORNITHORHYNCHUS, &c.

ORNITHOLOGY, the branch of natural history which deals with the structure, functions, distribution, and habits of birds. No group of the animal world is better defined than the class of birds. It forms the division of Vertebrata next in order and position to the Mammalia, and it may be shortly characterized as including vertebrate animals which possess *red, warm blood;* a *four-chambered heart* with a *double* or *distinct circulation;* having the *fore limbs* modified to serve as *organs of flight;* having the body *covered with feathers;* and as having the *bronchial tubes* or *air-tubes* of the *lungs* opening on the surface of these organs. These characters constitute the main points by which this great division of the animal world is recognized, but in addition to these there are other distinctive characters to be perceived and noted when a systematic survey of the class is made.

Birds are characteristically Hæmatotherma or 'Warm-blooded' Vertebrata. The temperature or heat of the bird body is relatively and absolutely greater in a general sense than in any other group of animals. Thus in Mammalia the average temperature ranges from below 100° Fahr. to 105° or more. In man the mean internal heat is about 100° Fahr.; in the whale it averages 105°; in birds the average temperature shows a much higher rate, and exhibits a range from 106° as an average low rate to 112° as a higher mean point. In mammals there may be further a diminution or loss of heat under certain conditions, such as those of hybernation, &c. The marmot, squirrel, dormouse, &c., lose from 10° to 20° Fahr. of heat on their retiring to hybernate. But in birds no such loss of heat takes place; the migratory instincts lead certain birds to seek a warmer clime when winter-time approaches; and even attempts to induce an artificial state of torpidity in birds have not been successful. In the bird class then, as a whole, a greater amount of activity, resulting in increased body-waste, takes place, and this latter result induces as a consequence the very high standard of temperature just alluded to.

Turning our attention firstly to the *external characteristics* and covering or exoskeleton of the body in birds, we find a marked adaptation in form, through which birds become, like the fish in its case and turn, admirably fitted for progression through the aerial medium. The form and shape of the body, the mode in which the feathers of the body are disposed and arranged, the modification of the fore-limbs to form wings, and the obvious adaptation of the skeleton and other regions and parts of the body, constitute collectively a series of harmonious elements in the general organization of birds such as cannot fail to strike the most casual observer.

The skin consists, as in higher Vertebrates, of the epidermis or outer skin, the intermediate *rete mucosum*, and the *corium* or true skin beneath. The true skin is in general but loosely attached to the muscles and structures below; it is continued to form the web or membrane connecting the toes, in Swimming-birds; and on the head and neck of the turkeys, cock, and other birds, it forms the 'combs,' 'wattles,' and coloured appendages familiar to all. These and other naked portions of the body frequently exhibit developments of colour which are present in the *rete mucosum*. Feathers, forming the characteristic body-covering of birds, constitute appendages of a unique kind, as being developed only in connection with the bird-class. The mode of development of feathers essentially resembles that of hairs—indeed a feather may be viewed as a greatly-modified hair of complex kind. (See FEATHERS.)

Feathers are inserted into the papillæ in which they take origin by the *quill*, *calamus*, or *barrel*, which forms the lowermost part of the feather, and is also the last part to be developed. The quill is continued upwards into the *shaft* or *scapus*, which is generally quadrate in shape, and on its inner or under surface exhibits a median groove. The shaft bears the *barbs* or rami, which collectively form the *web*, *vane*, or *beard*. Each barb lies with its flat side towards its neighbours, and bears the little *barbules*, through the interlacing of which the separate barbs of the web are kept in firm and close opposition. The under-plumage of most birds is formed by a thick coating of small feathers destitute of a central shaft, and consisting each of a small quill imbedded in the skin, bearing a tuft of unconnected barbs. This coating, especially developed in aquatic birds, constitutes the well-known *down*. The *quill-feathers* generally are those of stronger construction, borne on the wings and tail. Those investing the body, and which are of more slender make, are the *plumes* or *clothing*-feathers. Various names have been given by ornithologists to feathers, according to their position and situation on the body of the bird. The *auriculars* are those feathers that surround the opening of the ear; the *scapulars* are those attached to the scapula or shoulder-blade and to the humerus or bone of the upper arm; the *primaries* are the long quills borne on the bones of the hand, and which constitute the longest feathers in the wing; the *secondaries* are supported by the lower end of the fore-arm, whilst the *tertiaries* are those which arise from the upper extremity of the fore-arm; the *alula* or *bastard-wing* is the name applied to the quills borne by the small 'thumb.' The bases of the wing-quills are covered by a series of feathers collectively known as *wing-coverts*, and these latter are divided into *greater*, *lesser*, and *under* wing-coverts. The *rectrices*, or great feathers of the tail, are also covered by a set of feathers, constituting the *tail-coverts* or *calypteria*.

The plumage of birds in most cases is changed frequently before it attains its characteristic and full-grown state. Some birds attain their perfect plumage only after an interval of five years. In their first plumage the young of those birds in which the male and female differ in colour (for example, blackbird) resemble the female; and (as in the Swans) where both male and female are coloured alike, the young birds in their first plumage differ from both parents. Changes in plumage may be effected by the throwing off of the old and the development of new feathers; by the feathers merely altering in colour; by the development of a few new feathers only; or by the older tints and hues being worn away, so as to expose the brighter under-tints.

The mandibles or beak and feet are generally destitute of a feathery covering, but in many cases the feet may be feathered even to the toes, as in Owls. In the Vultures the wattles and folds of the neck are naked and bare. The jaws do not bear teeth, but are sheathed by horny or epidermic coverings, which, although ordinarily smooth, may yet bear serrations or tooth-like processes along their margins. The nostrils open upon the side, or at the base of the upper mandible, and this latter structure may be variously hooked, or may present toothed processes adapting it for the prehension or tearing of food. In Raptorial Birds and in Parrots, for example, the beak is strongly arched or hooked; in the Toucans and Hornbills the beak is enormously enlarged, but is of light texture; in Ducks it becomes flattened, and is provided with a sensitive skin adapting it for the performance of the sense of touch. The *cere* is the circle of naked skin which in many birds surrounds the base of the mandibles; and the term *gape* is

applied to the opening of the mouth, particularly at its hinder portion, at which part it is in many birds provided with bristles or filaments (as in Swallows, Goat-suckers, &c.), adapted for the capture of insect prey. The characters of the beak, together with those afforded by the conformation of the feet, afford valuable means for distinguishing the various groups and species of the bird class.

The *internal skeleton* of birds exhibits several points of importance and difference from that of other groups of Vertebrata. Thus, firstly, the bone-tissue of birds is singularly light and compact. The bones of birds are of much whiter texture than in Mammalia or in lower vertebrates, and they contain a larger proportion of phosphate of lime than is present in the skeleton of other groups of the sub-kingdom. This salt forms nearly 90 per cent. of the earthy constituents of the bones of birds. And an analysis of the bones of the hawk, for example, gives in 100 parts 73·28 of earthy material, and only 26·72 of animal matter. The bones of man contain 68·97 of earthy and 31·03 of animal matter. Whilst in many birds the shafts or hollows of the long bones are filled with marrow as in Mammalia, the more general rule is that such bones are *pneumatic*—that is, contain air instead of marrow. This arrangement is obviously for the purpose of giving to the skeleton generally the lightness adapting it for flight. The air is admitted to pneumatic bones by means of special apertures which exist in the bones, and which are placed in communication with certain sacs termed 'air-cells.' These sacs are filled with air from the lungs, in a manner to be noticed when treating of the respiratory system of birds. Small birds which fly well have few hollow bones, but larger flying birds possess the pneumatic structure in typical perfection. The bones most generally pneumatic are the humeri, cranial bones, and sternum. The femora or thigh-bones are more rarely pneumatic. In the wingless Apteryx of New Zealand (Pl. CXLVIII.–CXLIX. fig. 11) no pneumaticity is present in the whole skeleton. Many Passerine birds and Waders (for example, Divers, Gulls, Snipes, Moor-hens, &c.) have no bones pneumatic save some of the cranial ones; whilst in the genus *Buceros* (Hornbills) nearly all parts of the skeleton are permeated with air. Although the development of the pneumatic structure generally bears a certain relation to the powers of flight, it does not always follow that the most powerful flyers possess the greatest number of pneumatic bones. The cursorial Ostrich, for example, possesses a higher degree of pneumaticity than the actively-flying Gull. The bones in all young birds are filled with marrow; but as adult life is attained the bones become, to a greater or less extent, pneumatic, and accordingly as the adult form exemplifies that peculiarity or not.

The vertebral column or *spine* of birds, considered as the chief element in the internal skeleton, exhibits several points of interest. The vertebræ are always completely ossified, and more than six unite to form the *sacrum*. The *cervical* or *neck* region is the most mobile in the spine; the flexible neck, together with the beak, subserving the important office of prehension. In contrast to the mobility of the neck, we find the generally fixed, anchylosed condition of the dorsal region—this latter portion being fixed and immobile, giving support to the body, and forming a *point d'appui* for the movements of the wings. The neck is thus generally elongated, and is particularly lengthened in some cases, as in the Aquatic Birds —seen in the flamingo (Pl. CL.–CLI. fig. 12), or in the swan. The latter bird possesses twenty-three cervical or neck vertebræ, the lowest number being nine. In all birds the neck is of sufficient length to reach the *uropygium* or *oil-gland* situated at the tail, the secretion of which is used for 'preening' or dressing the feathers. The *dorsal* vertebræ are never fewer than four, or more numerous than nine. In some Vultures only four are present; whilst the Apteryx possesses nine. Six or seven are the most common numbers. Various degrees of union and immobility are found in connection with the dorsal segments of the spine. The middle and hinder segments are frequently ossified together, whilst the front dorsal segments are usually anchylosed, as already mentioned, to form a fixed point for the movements of the pinions in flight. In the Ostrich, Emeu, &c., and in the Penguins, in all of which the powers of flight are limited or abortive, the dorsal vertebræ exhibit a degree of mobility resembling that seen in other Vertebrata. The vertebræ interposed between the dorsal vertebræ and those of the tail or *caudal* segments are united in birds to form the *sacrum*. These vertebræ individually consist of those of the loins (*lumbar*) and of the *sacrum*. The number of vertebræ which may thus coalesce in birds to constitute the sacrum varies from nine to fifteen or seventeen—this last number being represented in the ostrich—or even twenty. The *coccygeal*, *caudal*, or 'tail' vertebræ, may number ten. The last two or more caudal vertebræ unite to form a bone, which, from its resemblance to a ploughshare, has received the name of the *pygostyle*, or 'ploughshare bone' (Pl. CXLVI.–CXLVII. fig. 2). This structure terminates the tail, and is destitute of any processes or medullary canal. It supports the wing-feathers of the tail, and also the *uropygia* or oil-glands, which secrete an unctuous fluid used in dressing the feathers; and which in the Aquatic Birds especially preserves the feathers from the action of the damp or wet. In the Cursorial or Running Birds the ploughshare bone is undeveloped, and in the Penguins it is also wanting. In the Woodpeckers, Tree-creepers, and in other Scansorial or Climbing Birds, this bone may bear an inferior flattened plate, of service in assisting the birds to climb by aid of the movements of the tail. The peculiarities in the caudal vertebræ of the peculiar extinct bird Archæopteryx will be referred to in treating of the palæontology of the class.

The bones of the *skull* in birds become firmly united at an early period, so as to leave little or no trace of the *sutures* or lines of union, as in Mammals—a complete bony case being thus formed. The skull is joined, as in Reptiles, to the spinal column by a single process, or *condyle*, of the occipital bone, or hindermost bone of the skull. The upper mandible of the beak is composed, in greater part, of the *intermaxillary bones*, the *superior maxillary bones* themselves being of small size, and ossified to the sides of the larger intermaxillary bones. The Parrots possess the latter bones united to the skull by ligament only, this arrangement permitting of a high degree of mobility. The lower jaw or inferior mandible is made up of six pieces on each side—being, as in Reptilia, a bone of compound nature, and not consisting of two simple halves as in the Mammalia. In the adult bird these various pieces or elements are ossified firmly together. As also in Reptiles, the lower jaw does not of itself or directly articulate with the skull, but indirectly and by means of a special bone—the *os quadratum*, or *quadrate bone*. This latter bone in birds is invariably movable. The palate may be elevated by the action of the lower jaw when depressed; the quadrate bone being connected to the jugal bone, which by the lowering of the lower jaw elevates the palate, and so brings the upper mandible also into motion in most birds. The *orbits* or cavities for the eyes are generally of large size in birds; in the Apteryx, however, they are of small size, as also in the Dinornis.

The *chest* or *thorax* in birds is formed posteriorly by the dorsal vertebræ, laterally by the ribs, and in front by the 'sternum' or breast-bone and the 'sternal ribs.' The ribs correspond in number with the dorsal vertebræ, from six to nine pairs of ribs being thus found in birds. Each rib articulates with the body of a single vertebræ by its head, and with the transverse process of the vertebra by its tubercle. The first two ribs—or the first four, as in the Cassowary—are generally 'false;' that is, they do not reach the sternum in front, but remain free and unattached. The ribs, with the exception of the first and last dorsal ribs, in many birds possess each a hooked process, which springs from the body of the rib, and which is known as the *uncinate process*. These processes pass upwards and backwards, and each is generally attached by ligament to the rib behind, although in some instances these processes remain unattached to other ribs. In the Emeu the uncinate processes are very small and rudimentary. The true ribs are joined to the sternum in front by bones which correspond to the costal cartilages of Mammals, but which in the bird are termed *sternal ribs*. These sternal ribs are movably articulated to the ribs themselves and to the breast-bone; and they form the movable parts of the chest in the movements of breathing. The breast-bone or sternum in birds is generally of large size and presents great relative proportions, which are especially large in those forms with well developed powers of flight. Even in the skeleton of the small Humming-bird (Pl. CXLII.–CXLIII. fig. 1) the great proportional size of the sternum may be well seen. The body of the bone varies in shape, and its relations to the life and habits of birds also differs. It thus bears a relation to the powers of flight and to the muscles of the wings; to the movements of the chest in breathing; and, as in Perching Birds, to the maintenance of a suitable position in sleep. The body of the sternum is generally more or less quadrilateral in shape, and bears, in birds of flight, on its front or anterior aspect a strong vertical median ridge or *keel*, to which the great *pectoral* or wing-muscles are attached. The size of this crest or keel accordingly bears a direct relation to the flying powers of the bird, or to the powers of diving. Thus in the swift-flying Humming-birds, and in most other birds, the keel attains large proportions; whilst in the Cursorial or Running Birds (for example, Ostrich, Emeu, &c., Pl. CXLVIII.–CXLIX. fig. 4), the wings being of rudimentary nature, the sternal keel is undeveloped, and the breast-bone presents a flat, shield-like conformation. In the Auks, Penguins, &c., in which the wings are useless as organs of flight, but are used with facility in diving, the sternal keel is well developed. Upon the upper or anterior surface of the sternum the *coracoid bones*—which exist in Mammals as mere processes of the shoulder-blade, but which in birds are developed to form the chief supports of the fore-limbs—are borne. At its upper portion each coracoid bone articulates with the *scapula* or shoulder-blade, and with one of the clavicles. The scapula is generally of small size, and each forms, by its articulation with the coracoid bone of its own side, the glenoid cavity or socket for the head of the humerus, or bone of the upper arm. The clavicles or collar-bones in birds are united in most birds to form the V-shaped bone known as the *furculum*, or 'merry-thought.' The merry-thought is generally joined at its angle by ligament to the tip of the sternal keel, whilst the other and separated extremities of the united collar-bones are articulated to the coracoid bones and shoulder-blades. In the Cassowary, Ostrich, and Emeu the furculum is of rudimentary nature; in the Apteryx it is entirely absent. In Toucans the usually united clavicles are separate, and are not connected to the sternum. In the Australian Ground Parrots (*Pezophorus*) they are abortive, or may be wanting entirely. The furculum forms a strong resisting medium to the forces which tend to drive the humerus inwards during the downward stroke of the pinion. And hence in those birds in which the powers of flight are very strong the clavicles are best developed, and their angle is more open, so as to increase their resisting power.

The *fore-limb* or *wing* of the bird exhibits the essential skeletal elements found in the fore-limb of all other Vertebrates. The *humerus* or bone of the upper arm is in general of shortened conformation; the fore-arm, composed of the *radius* and *ulna*, being the longest segment of the fore-limb. The ulna is by far the largest and best-developed of the two bones of the fore-arm, the radius being slender and attenuated. No necessity thus exists, in an organ adapted for flight, for rotation of the forearm as in man; indeed such a conformation would seriously impede the firm stroke of the wing. The bones of the *carpus* or *wrist* are similarly of fixed character, and are two in number. They are absent in the Apteryx and Emeu. A third carpal or wrist-bone, corresponding to the *os magnum* of the typical wrist, is also present in birds; but this latter is ossified to the second metacarpal bone, or second bone of the 'palm' of the hand. Three *metacarpal* bones are developed, but these are anchylosed together, and appear as a single bone. The metacarpal bone of the radial side of the hand corresponds to that of the index-finger. The second or middle metacarpal is the longest, and bears the 'os magnum' of the carpus. The third or ulnar metacarpal, or that of the 'ring'-finger. The radial metacarpal bone bears the largest finger or digit of the hand; this digit corresponding to the index-finger, and consisting of two or three phalanges. This metacarpal, near its base or carpal extremity, has attached to it a single phalanx, which forms the so-called *thumb*, bearing the *alula* or *bastard-wing*. The remaining finger, borne by the ulnar or third metacarpal, represents the 'ring-finger,' and consists of a single phalanx generally. In the Apteryx and cassowary a single complete finger only is found. The thumb is absent in the Penguins. In the ostrich, emeu, &c., a nail-like claw is borne by the last phalanx of the index-finger. This claw or spur is also found in the Spur-winged Goose, Jacana, Mound-Bird, &c.

The *pelvis* and hinder extremities of birds present certain peculiarities of conformation highly distinctive of the bird-class. The pelvis consists of the *ossa innominata* or *innominate bones*, each of which in turn consist of the *ilium*, *ischium*, and *pubes*, these three elements being ossified together to form a single bone. The innominate bone of each side is firmly united by ossification with the 'sacrum,' and sometimes with the last ribs and hinder dorsal vertebræ. The bones of the pelvis in all birds—save the ostrich—are not united below at the pubis as in other vertebrate forms, but are free and unconnected. The pelvis of birds is thus normally, and almost invariably, of an open description. In the Penguins the pelvis itself is attached by ligament merely to the sacrum; the waddling gait of these birds being thus due in part to the want of fixation of this region of the body. The chief adaptation of this open condition of the pelvis in birds appears to be that involved in the deposition of the large egg with its brittle shell.

The *femur* or thigh is short, the *tibia* or shin-bone forming the chief element in the leg; whilst the *fibula* is attenuated and of slim aspect, and generally ossified to the tibia. A *patella* or knee-cap may or may not be developed. Two knee-caps exist in each limb of the ostrich. The tibia has the proximal or upper portion of the *tarsus* ossified to its sub-

stance. And the distal or lower and remaining part of the tarsus is anchylosed with the *metatarsus* to form the characteristic *tarso-metatarsal* bone of the leg, which is seen to be greatly elongated in the Waders. The *ankle-joint* in birds, as in Reptilia, is therefore situated between the separated and divided portions of the *tarsal* bone. Three or four metatarsal bones are represented in the united tarso-metatarsus. A 'spur' or *calcar*, composed of a bony core ensheathed in horn, may be developed—as in the common fowl, &c.—on the posterior aspect of the metatarsus. The *toes* generally number four; the *hallux* or great-toe, when present, being composed of two phalanges, and the other toes of three, four, and five phalanges respectively. The Swifts have two phalanges in the hallux, and three in the other three toes. The Goat-suckers have also two phalanges in the hallux, three in the next toe, four in the middle, and three in the outer toe. The hallux or great toe is turned backwards when four toes are developed—the usual arrangement of the four toes being three in front and one, the hallux, turned posteriorly. In some forms (for example, Owls) the outer of the front toes can be turned backwards at will. In the Parrots, Cuckoos, Woodpeckers, &c., the outermost of the front toes is turned permanently backwards, so as to adapt the foot for climbing. In the Swifts all four toes are turned forwards. The hallux is wanting in the emeu, cassowary, bustards, and many swimming-birds, &c. The ostrich has but two toes, the third and fourth of the typical or five-toed foot. In the Trogons the second toe is turned backwards.

The muscles of birds are of firm consistence, and are generally coloured deeply red. The chief body-muscles are the *pectorals*, or those of the breast, which are devoted to the movements of the wings. Many of the tendons exhibit ossifications, particularly those of the flexor muscles of the toes, which are specially brought into action in perching. These flexor tendons pass behind the heel, and one in front of the knee-joint. The weight of the body in sleep, when the muscles are naturally relaxed, places the flexor tendon in front of the knee on the stretch, or in action; and thus mechanically, as it were, bends or flexes the toes, and so passively and involuntarily maintains the bird on its perch. The deposition in the tendons of calcareous matter thus adapts these structures for the prolonged and continuous strain to which they are subjected. The fibres of the muscular tissue of birds generally are firm and dense in their nature; the muscles of herbivorous birds being, as a rule, of paler colour and of more delicate nature than those of carnivorous forms. The *skin* or *cutaneous muscles* are very largely developed in birds, and have special reference in their action to the movements of the feathers. The Apteryx exhibits a very special development of such muscles. The larger or quill feathers in such birds as the Ducks, Geese, Pelicans, &c., each receive little muscular slips, by the action of which the feather can be moved in every direction. The muscles of the neck region are specially developed in birds, for the purpose of constituting the head and neck prehensile organs. A *diaphragm* or *midriff*, dividing the chest from the abdomen, is not of complete nature or of perfect construction in any bird. In the Apteryx and ostrich it is best developed.

The *digestive system* of birds includes firstly, the consideration of the beak and mouth as adapted for the prehension and reception of food. As already remarked, no teeth exist in any bird, although the horny sheaths of the jaws may exhibit processes or serrations of service in breaking down food. The structure of the beak itself has already been alluded to; and the varied forms of this organ will be found detailed in the specific descriptions of birds scattered throughout the volumes of this work. In the Raptores the beak is generally arched and strong, and adapted for tearing flesh; whilst in the Parrots the arched beak in some degree subserves mastication, since it is used to break up and divide the hard fruits and nuts upon which these forms chiefly subsist.

The tongue is generally invested, like the jaws, with a horny sheath, and in very many undoubtedly subserves a prehensile function. The sensitive part of the tongue exists near its root; but in the Parrots it is of soft, fleshy nature throughout, and more adapted to serve as an organ of taste than in most other birds. In the Lories the tongue is tufted anteriorly. In many birds the tongue is provided with filamentous appendages (as in the Fieldfares or Humming-birds), where the horny sheath splits into fine filaments at its apex; or as in the Vultures, in which the margins of the tongue are provided with recurved spines. In the Toucans bristle-like filaments project forwards from the sides of the tongue. In the Woodpeckers the apex of the horny sheath is provided with spines pointing backwards. In the Geese strong marginal spines exist; and in the Penguins the whole organ is beset with such processes. In the Ostriches, Pelicans, Kingfishers, &c., the tongue is very short. In the Snipes it is exceedingly elongated. The Ravens and Nutcrackers possess a bifid or forked tongue. This organ in birds is regarded as essentially consisting of a development of the 'glosso-hyal' or hyoid bone (*os hyoides*); the conformation of this bone in some birds (for example, Woodpeckers and Humming-birds) admitting of the protrusion of the tongue to a very great extent.

Salivary glands are always developed in birds, but differ widely in number, form, and position. Four pairs of salivary glands are generally found. The Solan geese appear to possess these structures in a rudimentary condition only; the Herons possess the sublingual glands alone, whilst in the Coots the parotid is of large size. In the Woodpeckers the sublingual glands are very largely developed, and their secretion, which is of a gummy or viscid nature, is of service to these birds in securing their insect prey. In the Crows the salivary glands are of very simple rudimentary kind.

The *œsophagus* or *gullet* (Plate CXLVI.–CXLVII. fig. 9, *a*) is generally elongated as corresponding to the length of the neck, and is usually distensible. It is of muscular conformation, and generally expands at the lower portion of the neck to form in many birds a sac-like cavity, known as the *crop* (fig. 9, *k*) or *ingluvies*. The walls of this structure —which may be viewed in function as a receptacle or storehouse for retaining food previous to its being passed on to the more important digestive organs—are generally of thin membranous description, and contain numerous simple mucous glands or follicles, the secretion of which is poured out on the contained food, and serves chiefly to moisten and soften it. The crop is present in the Raptores (eagles, vultures, &c.), and in the Granivorous birds (for example, fowls, parrots, pigeons); these forms generally picking up their food in greater quantity than can at once be digested. In omnivorous birds (for example, Toucans and Hornbills), in fruit-eaters and insect-eaters (Swifts, for example), which feed on small quantities, and in most of the Waders, the crop is absent. In the Owls it is feebly indicated; and in the Ostriches it is generally absent. It is wanting in Swans and Geese. It may be single, as in the Fowls, &c., or double as in the Pigeons. The crop in the latter birds, as is well known, secretes during the breeding season a fluid somewhat resembling milk in colour, and which is used to nourish

the miniature young. This secretion constitutes the so-called 'pigeon's milk.' In the Pelicans a large pouch-like receptacle exists between the halves of the lower jaw, in the floor of the mouth, and which is used to contain the fishes upon which this bird lives. This pouch is capable of containing 10 quarts of water.

The stomach of birds consists of two portions, which are ordinarily distinct and separated. The first of these divisions is the *proventriculus* or *ventriculus succenturiatus* (Pl. CXLVI.–CXLVII. fig. 9, *b*), and corresponds to the cardiac or œsophageal portion of the Mammalian stomach. This cavity may be viewed as that in which the food undergoes true digestion. Its lining membrane contains the glands which furnish the *gastric juice*, and through the action of this secretion the food is converted into chyme. In the Rasorial or Gallinaceous Birds the proventriculus is of smaller size than the gizzard; in the Parrots and Storks it is larger, and in the Ostrich it attains very large dimensions. In the Kingfishers it is exceedingly small. In the Eagle, Gannet, Sea-gull, &c., and in forms feeding on animal food generally, the gastric glands or follicles are of simple conformation; but in those forms feeding on vegetable matters (Fowls, Turkey, Ostrich, &c.) the glands of the proventriculus become much complicated in structure and form. To the proventriculus succeeds the second or muscular division of the stomach, corresponding to the pyloric portion in mammals, and known as the *gizzard* (Pl. CXLVI.–CXLVII. fig. 9, *c*). In flesh-eating birds the gizzard possesses thin membranous walls, whilst in the Rasores and in grain-eating birds generally it assumes its more typical development. In the latter case its walls become thick and muscular, its internal surface becomes provided with horny ridges and patches, and its entire structure evinces a perfect adaptation to the function of an organ for crushing, bruising, and triturating the hard grains upon which such birds feed. From the crop the grain is supplied to this apparatus after the fashion and in the relation of a 'hopper' to a 'grinding-mill.' Many birds (for example, Fowls, &c.) swallow pebbles and small stones, which aid the action of the gizzard in bruising the food; the Ostrich swallowing stones of very considerable size for this purpose. Pigeons similarly supply their young with gravel; and our ordinary Fowls, if deprived of pebbles, do not thrive. In those birds which swallow large stones in this way (for example, Ostrich, &c.) the aperture of the intestine is guarded by a valve. In many birds the proventriculus opens directly into the gizzard; but (as in the Auks, Parrots, &c.) a distinct interval separates these digestive cavities. Every gradation exists between the development of the gizzard in the flesh-eaters and in the grain-eating birds. As proved by Hunter, who fed a fish-eating sea-gull on barley alone, the naturally thin-walled gizzard, as in the latter case, may become very thick and muscular. And as a general rule with birds, as with other animals, the digestive system of a form feeding on vegetable matters is longer and of more complicated structure than one feeding on more readily digested animal food.

The *intestinal canal* begins at the gizzard or pyloric portion of the stomach. The intestines are of shorter relative length in birds as compared with their length in Mammals. The canal is divided into the *large* and *small* intestines; the beginning of the large or terminal portion of the intestine being indicated most commonly by the presence of one or two *cæca*, or blind pouches or sacs, or by an internal valve. In some cases no distinct separation can be perceived. The *duodenum*, marked *d* on the figure, or first portion of the small intestine, forms a loop in which the *pancreas* or 'sweet-bread' is inclosed. The small intestines (*h*) are longest in the vegetable-feeding birds. The large intestine (*f*) is in the vast majority of cases a simple straight and short tube, seldom exceeding one-tenth of the body in length, and which terminates in the *cloaca*—a chamber or cavity which also receives the terminal ducts of the urinary and generative organs (*g*). The *cæcal appendages* (*e*), alluded to as existing at the commencement of the intestinal tract, vary much in size. They are sometimes absent, as in the Toucans, Parrots, Wry-necks, &c. In the Grouse they are of enormous length, and in the Ostrich they are very wide, whilst in the Cassowary they are deficient.

The *liver* of birds (fig. 9, *i*) exhibits a bilobular or divided condition, and is generally coloured of a distinct brownish hue, which is deepest in aquatic birds. A gall-bladder is absent in a few cases only—as in the Ostrich, Pigeons, and some Parrots—and occasionally in the Apteryx. The ducts conveying the bile into the intestine open near the extremity of the loop or fold of the duodenum. The pancreas has been already mentioned as lying within that loop; its ducts opening into the intestine higher up than the bile-ducts. It is generally of large size, but is small and single in conformation in the Herons and Cuckoos. It possesses three ducts in the Raptores, Pigeons, and Ducks; more commonly it has two only, or but one, as in the Ostrich and Cassowary.

The *kidneys* of birds are two in number, and are of large size and elongated shape. There is no division of the internal surface of the kidney of birds, as in Mammals, into a cortical and medullary portion. (See KIDNEY.) The absence of any excretory function as performed by the skin of birds devolves a greater activity upon the kidneys. The *ureters* or efferent ducts of the kidneys pass behind the large intestine, and open by valve-protected orifices at the lower portion of the *cloaca*, which lower portion, from the proximity of the generative orifices, is termed the *urogenital space* or *cavity*. The space between this latter cavity and the termination of the rectum is sometimes termed a rudimentary urinary bladder, in which the urine may be collected, and which is best developed in the Ostrich, in Owls, Pelicans, Grebes, Swans, Bustards, &c. The *urine* of birds generally consists in greater part of earthy matters, and contains but a small proportion of water. Hence its whitish appearance when voided along with the fæces. The *supra-renal capsules* of birds are developed as two small bodies, coloured brightly yellow, and situated one on the middle or inner aspect of the upper portion of each kidney.

The *spleen* of birds is generally of small size. It is generally rounded or oval; or may be elongated (Gull), or broad and flattened (Cormorant). It lies under the liver, and on the right side of the proventriculus. The *uropygium* or *oil-gland* of the tail has already been mentioned. Its structure shows secreting follicles or tubules, and a central cavity. It consists of two united halves or lobes, and is most fully developed in aquatic birds. The *Bursa fabricii*—absent in the Ostrich—is situated in the pelvic cavity between the ureters, and behind or above the cloacal cavity. It is a glandular structure, and opens by a duct into the cloaca. It is largest in young birds, and its functions are wholly undetermined.

The *absorbent system* of birds possesses thin walls, the absorbents are loosely connected to the surrounding tissues, and have fewer valves than the absorbents of Mammals. The *chyle* resulting from the digestion of food in birds is colourless. The two *thoracic ducts* in which the absorbents terminate enter the circulation by the right and left jugular veins respectively. The *heart* of birds is highly muscular, four-chambered, and

the course of the circulation does not differ in any respect from that observed in Mammalia or in man himself. The right side of the heart is thus exclusively occupied with sending impure or venous blood to the lungs to be purified, whilst the pure aerated blood from the lungs is returned to the left side of the heart, and is by the left auricle received and by the left ventricle circulated through the body. The *blood* of birds is coloured deeply red. Its temperature has already been alluded to. The red blood corpuscles of birds are *nucleated*, of elliptical form, and flattened. The average long diameter of the blood corpuscles is $\frac{1}{2100}$th of an inch, the average short diameter being $\frac{1}{3800}$th of an inch. The blood corpuscles of the humming-bird exhibit a long diameter of $\frac{1}{3000}$th of an inch, and those of the ostrich in their long axis measure $\frac{1}{1645}$. Those of the humming-bird measure $\frac{1}{4000}$th and those of the ostrich $\frac{1}{3000}$th in their short diameters. These examples indicate perhaps the extremes of size in the class. As in Mammals the heart is inclosed in a pericardium. The *aorta* or great artery of birds, springing from the left ventricle of the heart, divides into three chief branches near its origin; and the vessel turns over the *right* bronchus, or air-tube of the right lung, to become the *descending aorta*, and not over the *left* bronchus, as in Mammalia.

The *lungs* and respiratory system generally of birds evince very marked peculiarities of structure, which constitute diagnostic features of the class. The lungs are confined to the back portion of the body, and are attached to the ribs, instead of being free, as in Mammalia. They are not divided into lobes, and are usually of a bright red colour. In texture they are spongy and less firm than the lungs of Mammals, and are covered by the pleuræ in front only. The two *bronchi* or main air-tubes into which the windpipe divides—one going to supply each lung—enter the lungs in the middle line at the upper and front portions. The main divisions of each bronchus are continued through the lung, and at length come to open on its surface in distinct apertures, which, as will be presently noticed, communicate with certain cavities—the *air-receptacles* or *cavities*—in the interior of the body. The air-cells or spaces of the lungs themselves, in which the blood is purified, are given off from smaller or tertiary branches of the bronchi, which spring from the secondary divisions—or those of the main and principal air-tubes which are continued onwards to the surface of the lung. The essential structure of the lungs of birds, so far as the form and disposition of the air-conveying apparatus is concerned, is of a tubular description, the mass of the lung being made up of fine tubes—the tertiary branches of the main bronchi—the walls of which are provided with minute sacs or cavities. These sacs or cavities are invested with net-works of capillary blood-vessels—the ultimate branches of the pulmonary artery—in which the venous blood is exposed to the action of oxygen in the air inhaled into the lungs.

Thus part of the air taken into the lungs of birds is appropriated to the purification of the blood as in other and allied Vertebrates. But part of the inspired air escapes from the lungs through the openings of the bronchial tubes on the lung-surfaces; this air being sent into special receptacles existing in the thoracico-abdominal cavity, and thence distributed to the interior of the 'pneumatic bones' of the skeleton. The object of this distribution of air throughout the body of the bird is of course primarily connected with the reduction of the specific gravity of the body so as to render the bird light for flying, an analogous result being attained in the insect-class by the distribution of the tracheæ or air-tubes throughout the body. But apart from its functions, *the open structure of the lungs of birds*, through the bronchi opening on the surface of the respiratory organs, forms one of the most characteristic features of the class; and no analogous or similar feature is found in any other group of the vertebrate series.

The openings of the bronchial tubes upon the surface of the lungs generally number eight in all, and are continued into the air-cells of the body. These latter are cavities or sacs formed by foldings or reflections of the pleura and peritoneum; the membranous walls being sometimes, as in the cassowary or ostrich, of firm structure. The chief air-cells of the body are disposed in a definite manner. Thus the *interclavicular* air-cell has been described as situated between the united clavicles or furculum; the *anterior thoracic* cell contains the bronchi, the lower larynx or organ of voice; and there are also two *lateral air-cells;* the *liver* air-cells (*cellulæ hepaticæ*); the *cellulæ abdominales* or *abdominal* cells; and the *pelvic* cells. These air-cells were discovered by John Hunter and Camper, and the air-cavities of the pneumatic bones, as already mentioned, are filled with air from these receptacles. Definite apertures exist in such bones through which the air is admitted. The Pelicans possess a most perfect distribution of air-cells, whilst in the Apteryx these cavities are wanting.

The uses of the perfect distribution of air throughout the body of birds may be thus summarized: Firstly. The specific gravity of the body is reduced, and flight rendered more easily performed in consequence. Secondly. The more perfect aeration of the blood is secured; and in consequence, thirdly, the heat of the body is maintained at a greater temperature than would otherwise be possible; and fourthly, through the great amount of air inspired birds are enabled to prolong their notes in song to a great degree.

The *trachea* or windpipe is of great relative length in birds, and is adapted to the length of the neck. The rings of the windpipe are mostly ossified in birds, and the tube itself may exhibit dilatations of its calibre; whilst sometimes, as in the wild swan, &c., the lower part of the trachea may be curiously twisted before it divides into the bronchi. In birds an *upper larynx* exists at the root of the tongue, and a *lower larynx*, which latter is the chief organ of voice, is also developed at the lower part of the trachea before its division into the bronchial tubes. The lower larynx is always of more complicated structure than the superior organ.

The *nervous system* of birds evinces a marked superiority over that of the allied reptilian class. The cerebrum, or true brain, is larger than in the latter, but its surface is not convoluted, as in most Mammalia. The *corpus callosum*, or connecting-band existing between the halves of the cerebrum in higher mammals, is wanting in birds. The cerebrum consists chiefly of the structures known in human and mammalian anatomy as the *corpora striata*. The *cerebellum*, or lesser brain, is invariably present, its mass chiefly consisting of the central lobe or *vermiform process* of the human anatomist. The lateral lobes of the cerebellum are rudimentary or wanting in birds. The *optic nerves* are usually of very large size, and the *sympathetic* system is well-developed. The *senses* are present in tolerable perfection. The *eyes* are well-developed in all cases; they are most prominent in the Owls, and smallest in some swimmers. They are only slightly movable. The eye is conical in front and spheroidal behind. The outer or sclerotic coat of the eye is strengthened by a series of from twelve to twenty osseous plates interposed between its two layers. Eyelashes are not commonly developed. Both upper and lower eyelids are present, and in addition the peculiar 'third eyelid,' or 'nictitating membrane,' is developed. (See Nic-

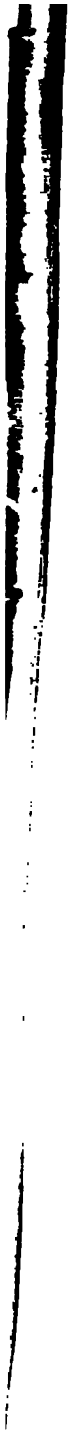


Fig. [1] *Skull of Parrot.* [2] *Head of Green Parrot.* [3] Sulphur-crested Cockatoo. [4] Blue and Yellow Macaw. [5] Warblin
[12] *Foot of do.* [14] Bee-eater. [15] Hoopoe. [16] Roller. [17] Wryneck. [18] Foot of do. [19] Middle Sp

[6] Owl Parrot. [7] Toucan. [8] Green Jacamar. [9] Resplendent Trogon. [10] Cuckoo. [11] Head of do. [12] Kingfisher
[20] Head of Black Woodpecker [21] Goatsucker. [22] Head of do. [23] Swift. [24] Topaz Humming-bird.

1. Skeleton of Humming bird 2. Cock of the Rock. 3. Tyrant or King Bird. 4. Synallaxis 5. Menura or Lyre Bird.
14. Head of Calandra Lark. 15 Foot of Lark. 16. Golden Crest. 17. Nightingale. 18. Fieldfare.

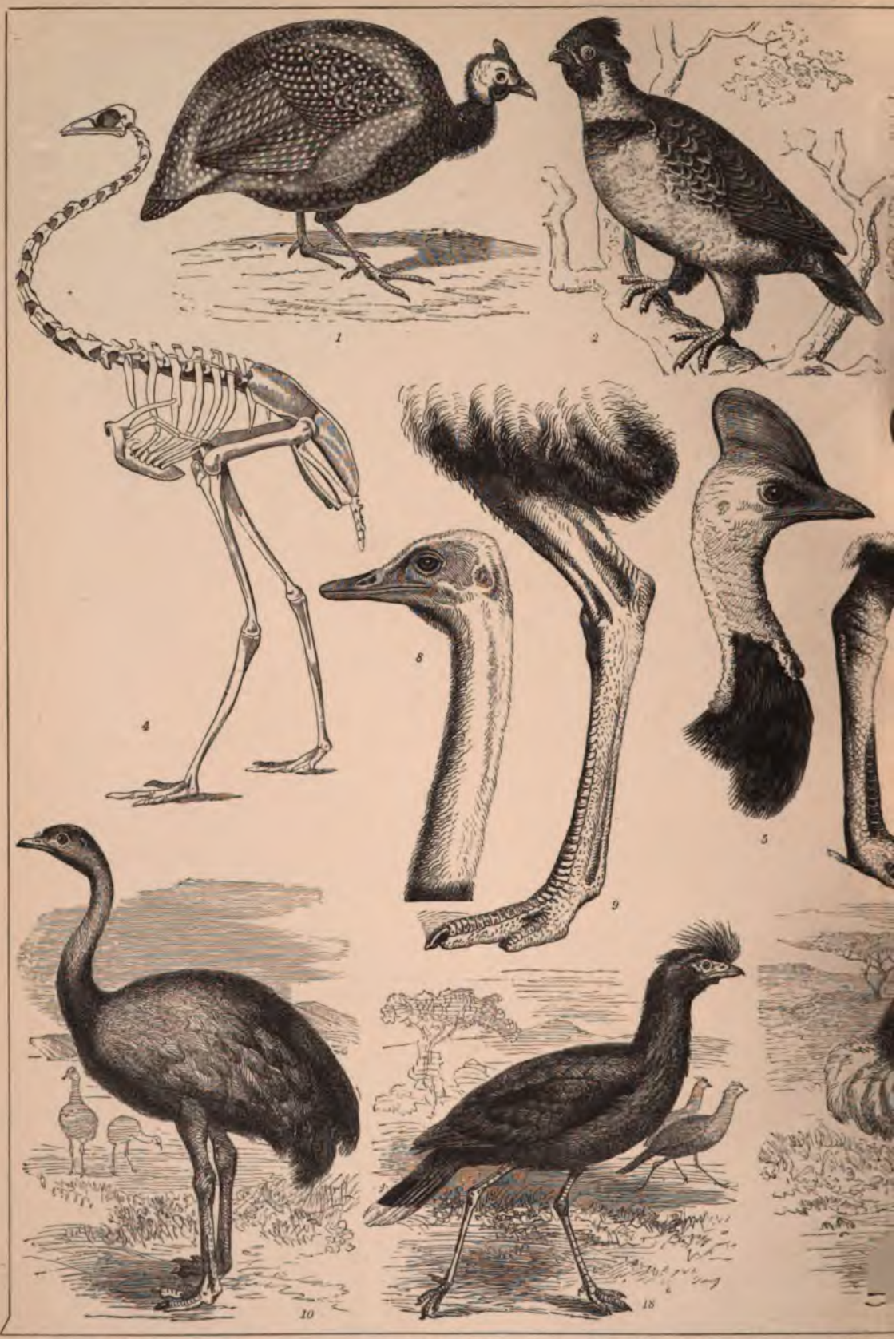
...e Whydah bird. 7. Siskin. 8. Sparrow. 9. Bullfinch. 10. Hawfinch. 11. Crossbill. 12. Whitethroat. 13. Crested Lark.
...bird (a, male; b, female). 20. House Swallow. 21. Waxwing 22. Head of Flycatcher. 23. Head of Wren.

1. Wren. *2.* Golden Oriole. *3.* Red-backed Shrike. *4.* Wall Creeper. *5.* Head of Nut-hatch. *6.* Great Titmouse. *7.*
14. Eagle Owl. *15.* Tawny Owl. *16.* Condor. *17.* Cinereous Vulture.

d Tit. 8. Boat-Tail. 9. Starling. 10. Bird of Paradise. 11. Magpie. 12. Common Chough. 13. Alpine Chough.
Vulture. 19. Golden Eagle. 20. Sea Eagle. 21. Short-toed Eagle.

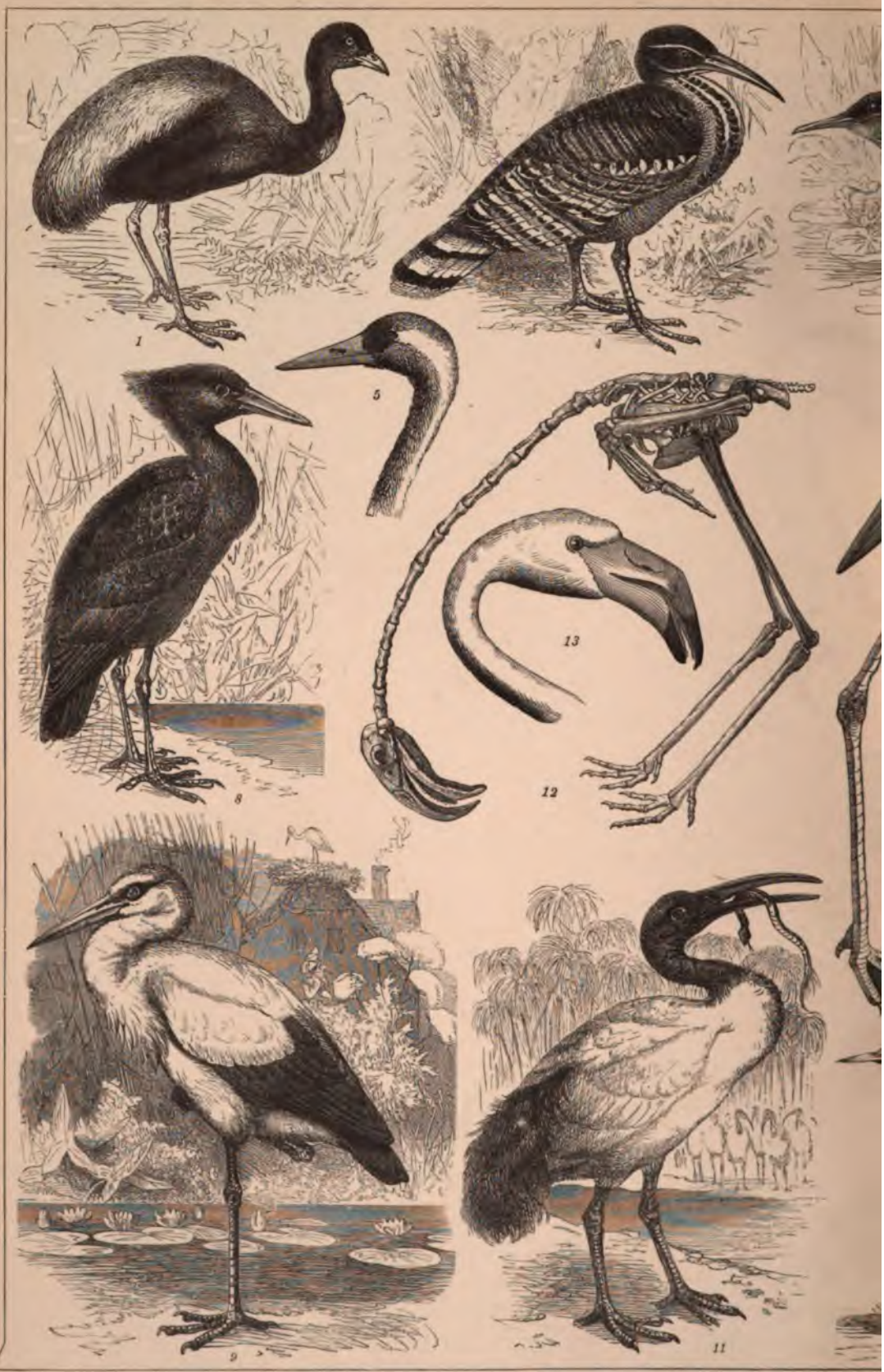
1 Bearded Vulture. *2. Skeleton of do.* 3. Goshawk. 4. Gerfalcon. 5. Secretary Bird or Serpent Eater. 6. Tooth billed Pige
male and female 14. Black-cock. 15. Partri

7. Ring-dove. 8. Head of do. 9. Digestive System of Common Fowl. 10. Sand Grouse. 11. Quail. 12 and 13. Capercaillie—
16. Turkey. 17. Gold Pheasant. 18. Jacana.



1. Guinea Fowl. *2.* Hazel Grouse. *3* Hocco *4, 5,* and *6.* Skeleton, Head, and Foot of Cassowary. *7.* Ostrich. *8.* Head, *16.* Sheath bill.

'oot of do. *10.* Nandu. *11.* Kiwi or Apteryx. *12.* Woodcock. *13.* Head of Snipe. *14.* Oyster catcher. *15.* Head of Lapwing.
Bustard. *18.* Seriema.



1. Agami *2.* Horned Screamer. *3.* Water Rail. *4.* Variegated Helias. *5.* Head of Crane. *6.* Bittern. *7.* He
16. Wild Duck. 17. Eider Duck. *18.* Coot.

8. Umber. 9. Stork. 10. Head of Avocet. 11. Ibis. 12, 13, and 14. Skeleton, Head, and Foot of Flamingo 15. Swan.
20. Head, and 21, Foot of Smew. 22. Head of Pelican.

1. *Foot of a Pelican* 2. Gannet. 3. Frigate Bird. 4. Cormorant. 5. Darter. 6. Cape Petrel. 7. Albatr
15. Common Guillemot and Black Guillemot.

Gull. 9. Skeleton of Penguin. 10. Crested Grebe. 11. Razor Bill. 12. Great Auk. 13. Little Auk. 14. Puffin.
17. Skua. 18. Ca p'an Tern. 19. Tropic Bird.

TITATING MEMBRANE.) The sense of *smell* is not very highly developed in the generality of birds. The outer nostrils open generally on the sides or at the base of the upper mandible; and these cavities occasionally communicate internally. The nostrils are situated at the end of the elongated mandible in the Apteryx. Sometimes the external apertures of the nostrils are protected by feathers (Crows), bristles, or, as in some Rasores, by a scale-like plate. No external *ear* exists, but the external auditory apertures are generally protected by folds of the skin (as in Owls), or by circlets of feathers, which can be raised at will (as in Ostriches and Bustards), so as to catch the waves of sound. Internally the ear exhibits a tympanum situated at the base of a short wide auditory canal. A single long ossicle is attached to the tympanum, the cavity of which is of large size, and is placed in communication with spaces in the cranial bones, and with the mouth by a Eustachian tube. A labyrinth, with vestibule and cochlea, exists, and three semicircular canals are found. The sense of *touch* is not well developed in birds. The bill acts in a general way as a tactile organ, as also does the horny tongue; whilst the *cere*, or space at the base of the bill, uncovered with feathers, also subserves this sense. In some aquatic birds (for example, Ducks, Geese, &c.), which grope for their food amongst mud, the upper mandible is provided with a highly sensitive skin. The apex of the snipe's bill is also specially sensitive. The sense of *taste* is also in abeyance, from the peculiar structure of the tongue already described. In those birds possessing fleshy tongues (for example, Parrots) this latter sense may no doubt be more perfectly developed.

The *generative* organs of birds consist of the essential organs or testes of the male, accompanied in some cases (Ducks, Geese, Storks, Ostriches, &c.) by the development of a true penis or intromittent organ. The testes are two in number, and are placed behind the lungs and lying upon the kidneys. They are of small size in winter and during the intervals between the breeding seasons, but increase largely in size at the latter periods. Impregnation of the female is effected in those cases in which a penis is absent by the simple apposition of the generative apertures of the male and female. The female generative apparatus in birds is generally developed on one side only—the left—of the body, the organs of the right side being usually abortive. The female organs consist of an *ovarium* or ovary, in which the eggs are developed; of an elongated and tortuous *oviduct*, through which the egg passes, and in which the albumen or 'white' is added to the egg as it descends; whilst in the expanded lower portion of the oviduct a process of calcification occurs, and the 'shell' is thus formed. The oviduct opens into the cloaca. The eggs being expelled—and birds being thus truly *oviparous* animals—they are hatched by the process of *incubation*—a feature or labour seen and performed in greatest perfection in the class before us. The young bird in many instances is provided with a little limy process on the upper mandible, by which it breaks through the shell at the fitting period when incubation terminates and its development is complete. This little process is soon absorbed after the young bird makes its entrance into the world.

Very great differences exist in the size, form, and number of eggs which may be produced by birds. Thus some birds (Frigate Birds, Auks, Petrels, &c.) lay but a single egg; the Skua Gulls produce two in a season, the Common Gulls three, whilst the majority of other birds, and especially the gallinaceous birds, produce many eggs at a brood, and may produce several such broods annually. The Cuckoo's egg is the smallest relative to the size of the bird; that of the Apteryx is the largest, similarly viewed. A temperature of about 100° Fahr. continuously applied represents the degree of heat necessary for successful incubation. The Emeu (male) sits for fifty-four days; the Rhea (male), thirty-five; the Puffin, Mandarin Duck, and Golden Eagle, thirty days; the Heron and Capercailzie, twenty-eight, and the Ring-dove, Belted Kingfisher, and Starling, sixteen. The varieties of nest, viewed as to mode and materials used in construction, are endless (see NEST). In the Swallows, Doves, Crows, Parrots, and most Waders, the sexes are outwardly alike; in the Eagles, Falcons, &c., the female is the larger; in gallinaceous and other polygamous birds the female is less than the male, and the latter is most brilliantly coloured.

The habits of birds, regarded with reference to their mode of life and food, form topics treated of in the articles which refer to the distinct kinds or species of birds; and the interesting subject of MIGRATION is noticed under the article of that name. Those birds which are permanent residents in a given country are termed *aves manentes;* those which move about at indefinite periods or without distinct aims in view, and chiefly guided by the scarcity or plenty of food (for example, Woodpeckers), are termed *aves erraticæ;* whilst the true migratory birds (for example, Swallow, Cuckoo), which fly at stated periods from one land to another, and the objects of whose flight are almost undeterminable, are termed *aves migratoriæ.* Those birds which on leaving the egg are able to run about, which seek food for themselves, and which are thus independent of parental care, are termed *autophagi* or *aves præcoces.* Those which are born blind, destitute of feathers, and in a helpless condition, are known as *aves altrices* or *heterophagi.*

Classification. — The classification of birds has always constituted a task of much difficulty to the zoologist. This difficulty arises chiefly from the fact of the uniformity of the characters presented by its included members; and by the consequent absence of any marked differences or distinctive points which the systematic naturalist might seize upon as diagnostic marks whereby to separate or divide the class. The simplest classification, and that most generally adopted, is that founded on the characters of the beak and feet, and therefore necessarily to a great extent on the *habits* of birds. The habits of animal forms do not present sure guides for true or structural classification, and therefore this first mode of arrangement, if simple, is not altogether of a philosophical or highly scientific kind. Former, but now obsolete systems arranged the birds according to the degree of perfection attained by the young on quitting the egg—as above detailed.

Nitzsch grouped birds in three divisions: the first included the aerial birds (*Luftvögel;* for example, Eagle, Lark, &c.); the second embraced land birds, (*Erdvögel*), such as the Ostrich, Fowls, &c.; and the third group contained the Water-birds (*Wasservögel*). This system founded on habits, even of a less definite kind than those indicated by the beak and feet, is not now employed in zoology. Huxley, endeavouring to proceed on a more scientific (that is, a structural) mode of classification, divided the birds into three groups. The first of these latter was the *Carinatæ*, distinguished by the fact that the breast-bone was provided with a keel or *carina*. This group, it need hardly be mentioned, includes nearly all existing birds; and although the method of the arrangement is strictly correct, yet the vast number of forms included in this first group, and the difficulty of further arranging them in subordinate divisions, militates against the practical use and adoption of

Huxley's system. His other two groups are the *Ratitæ*, distinguished, according to Huxley, by the flat, raft-like (Latin, *rates*, a raft), and keelless condition of the breast-bone, represented by the Ostrich, Emeu, Cassowary—the Cursorial or Running Birds of the ordinary arrangement; and the *Saururæ* ('lizard-tailed'), includes but a single bird, now extinct—the *Archæopteryx*. And the possession by this fossil form of a long reptilian-like tail, and of other anomalous characters, constitutes the ground for its being thus included in a separate and distinct group.

The ordinary classification divides the class of birds into eight orders—the last of which—the *Saururæ* of Huxley—is retained to include the Archæopteryx. A very brief enumeration of the leading characters of each order will suffice in the present instance, since the various divisions of the class are more fully treated of under their own special headings. See CURSORES, GRALLATORES, INSESSORES, NATATORES, RAPTORES, &c.

The *Raptores*, or Birds of Prey, form the first order. They possess a strong curved beak, sharp at the edges, and pointed or acute at the apex. The legs are short, and of strong conformation. The toes are arranged three in front and one behind, and are armed with powerful hooked nails or talons. The base of the bill is covered by a 'cere,' in which the nostrils open. The wings are well developed. These birds are divided into the *Nocturnal* Raptores, represented by the Owls; and the *Diurnal* Raptores, exemplified by the Eagles, Falcons, Kites, Vultures, Hawks, &c. In Pl. CXLIV.–CXLVII. illustrations of this order will be found. See figs. 1–5 in Pl. CXLVI.–CXLVII.; and figs. 14–21 in Pl. CXLIV.–CXLV.

The second order is that of the *Insessores* (which see) or Perchers; sometimes also known as that of the Passeres or Passerine Birds. These birds, including most of our smaller and familiar song-birds, are distinguished chiefly by their negative characters, and by the absence of the more marked points and features of the other orders. The legs are slender. The toes are arranged three in front and one posteriorly. The two outer toes are generally united by a short web or membrane, and the whole foot is adapted for perching. The divisions of this group will be found detailed in the article INSESSORES. The tarsi and toes are always covered by scales or are *scutellate*. These birds are represented by Crows, Hornbills, Jays, Magpies, Nut-crackers, Birds of Paradise, Starlings, Finches, Shrikes, Thrushes, Wrens, Lyre-birds, Honey-eaters, Humming-birds, Kingfishers, Swallows, &c. &c. The order is illustrated in Pl. CXL.–CXLI. by figs. 12–16, 21–24; in Pl. CXLII.–CXLIII. by all the figures; and in Pl. CXLIV.–CXLV. by figs. 1–13.

The third order, that of the *Scansores* or Climbers, is distinguished by its members possessing two toes directed forwards, and two backwards. The powers of flight are of moderate extent. The bill varies in form; in the most typical members of the group (for example, Parrots) it is hooked and curved, and assists these birds in their climbing habits. They are all monogamous. The food consists of fruits and insects. The nests are constructed in the holes of trees. This order is exemplified by the Parrots, Lories, Cockatoos, Macaws, Toucans, Trogons, Cuckoos, Woodpeckers, Wry-necks, Plantain-eaters, &c. Figs. 1–11, and 17–20 in Pl. CXL.–CXLI. illustrate this order.

The *Rasorial, Gallinaceous*, or Scratching Birds form the fourth group. These birds possess three front toes terminated by short blunted nails and a small hinder toe placed usually at a higher level than the front members. The legs are short and stout, and are feathered down to the joint between the tibia and tarso-metatarsal bone; the nostrils are protected by scales; the upper mandible is arched and vaulted, the nostrils opening at its base; the nest is of rude construction. Most are polygamous. The powers of flight are of moderate extent. The Fowls, Turkeys, Pheasants, Partridges, Grouse, Guinea-fowls, Ptarmigans, Mound Birds, Pigeons, Ground Pigeons, Dodo, &c., represent this order. Illustrations will be found in Pl. CXLVI.–CXLVII. figs. 6–17, and in Pl. CXLVIII.–CXLIX. figs. 1–3.

The *Cursorial* or Running Birds, represented by the Ostrich, Emeu, Rhea, Cassowary, Apteryx, are distinguished by the keelless sternum; by the elongated muscular legs, adapted for walking; by the absence of a hinder toe in all except the Apteryx, the front-toes numbering two or three; by the short blunt nails with which the toes are provided; and by the barbs of the feathers being unconnected to form a web or vane. The wings are of rudimentary size and nature; and many of the long bones contain marrow. The order is illustrated in Pl. CXLVIII.–CXLIX. figs. 4–11.

The sixth order is that of the *Grallatores* or Wading Birds, which are recognized by the elongated legs, chiefly formed by the great development of the tarso-metatarsus. The legs are destitute of feathers; the toes are elongated, and are never completely webbed; three front-toes exist, whilst the fourth or hinder-toe may be wanting, or of abortive nature. The tail is short, but the wings are well developed; the beak is for the most part elongated, the neck being slender and of lengthened conformation. In habits the Grallatores are semi-aquatic, and wade about in shallow waters seeking for their food. The diet generally consists of fishes, worms, molluscs, or even insects; some (for example, Storks) subsisting on vegetable food. The order is represented by the Coot, Rail, Crake, Screamer, Jacana, Crane, Heron, Ibis, Stork, Spoonbill, Snipe, Ruff, Woodcock, Curlew, Sandpiper, Oyster-catcher, Plover, Lapwing, Bustard, &c. The illustrations in Pl. CXLVIII.–CXLIX. figs. 12–18, and in Pl. CL.–CLI. figs. 1–11 represent this group.

The last order of living birds is that of the *Natatores* or Swimmers, which are distinguished by the more or less completely webbed toes, of which three or four may be developed, the hinder toe in some cases being rudimentary or wanting. The body is boat-like, the legs being placed far back on the body; the neck is generally elongated; the 'downy' undercovering of feathers is very complete in these birds. They are generally polygamous. The bill varies in shape, but is for the most part of flattened conformation. This large order is represented by the Penguins, Puffins, Auks, Grebes, Guillemots, Gulls, Terns, Petrels, Pelicans, Cormorants, Gannets, Frigate-birds, Darters, Ducks, Geese, Swans, and Flamingoes. It is illustrated by figs. 12–22 in Pl. CL.–CLI. and by all the figures in Pl. CLII.–CLIII.

Palæontology.—Birds are not plentifully represented as fossil organisms, a fact probably arising from their free aerial habits precluding the frequent deposition of their bodies in situations in which they would be likely to become fossilized or petrified. The earliest traces of birds have been found in rocks belonging to the Triassic period, and forming sandstones in the valley of the Connecticut River of the United States of America. These traces consist of three-toed footprints, presumed to be ornithic or of bird character. It is but right to state, however, that certain palæontologists incline to the belief that these footprints may rather have been those of certain extinct rep-

tiles which seem to have possessed the power of walking on two legs, like birds. The oldest actual bird-fossil is that found in the Solenhofen slates of Bavaria, a formation belonging to the Upper Oolite period. This single and unique fossil is the *Archæopteryx Macrura*, the solitary representative of the order Saururæ. This form differed from all existing birds in the elongated reptilian nature of its tail, which was composed of simple vertebræ, each bearing a single pair of quill-feathers. No ploughshare-bone existed as in living birds. The metacarpal bones were not ossified together as in all other existing or fossil birds; and it possessed two free claws attached to the wing, structures wanting in every other bird-form. It averaged the size of a rook, and appears to have been a vegetable feeder, and to have perched on trees like ordinary insessorial birds.

In the Chalk or Cretaceous deposits of America remains of wading-birds (genera *Palæotringa Laornis*, and *Telmatornis*) occur. A cormorant (*Graculavus*) has also been described as occurring in the same formations. The tertiary rocks contain many bird-fossils. The Eocene deposits of France contain the remains of a large bird rivalling the ostrich in size, and known as the *Gastornis Parisiensis*. The same deposits in England give the remains of a vulture (*Lithornis vulturinus*); and the oldest insessorial bird is found as a fossil in the Eocene of Glaris (Swiss), this form being the *Protornis Glarisiensis*. Miocene and Pliocene strata contain abundant bird-remains. The Parrots, Trogons, Petrels, Cranes, &c., are therein represented. And in Pleistocene or Post-tertiary formations remains of gigantic wingless birds occur, some of which (for example, *Dinornis* of New Zealand) almost unquestionably survived the human period. The Pleistocene formations of New Zealand afford a rich store of such remains, these islands being inhabited in the present day by the wingless *Apteryx*. The genera *Dinornis*, *Palapteryx*, and *Aptornis* represent these large extinct New Zealand birds. *Dinornis elephantopus* must have stood about 10 feet in height. In Madagascar fossil remains of a large bird, the *Æpiornis*, have been found; the eggs of this latter form, also found fossilized, measuring from 13 to 14 inches in diameter, and equalling 148 hen's eggs in size. In Mauritius the Dodo became extinct about 300 years ago; and in the Island of Rodriguez the Solitaire (*Pezophaps*), a wingless bird, similarly died out of existence within recent historic times.

ORNITHORHYNCHUS (*Ornithorhynchus paradoxus*), the Duck-billed Water-mole of Australia, formerly known as the Platypus, and of which but a single species is known. With the Echidna or Porcupine Ant-eater of Australia it forms the order Monotremata—the lowest division of the Mammalian class. (See MAMMALIA, MONOTREMATA, and ORNITHODELPHIA.) The external appearance of this animal is sufficiently strange and anomalous to excite the curiosity of the unscientific; nor can it be wondered at that when first brought to England it was regarded in the light of a manufactured monstrosity. The Ornithorhynchus and Echidna were first described by Dr. Shaw in 1792, the former being named *Platypus anatinus*. Blumenbach placed the water-mole in his division of the Palmate Mammalia intermediately between the walrus and otter, being led to this step chiefly from the webbed nature of the feet. Shaw placed it among the Bruta or Edentata from a consideration of its toothless condition. Sir E. Home and Geoffroy St. Hilaire were inclined to regard these animals as differing from all other mammals in their mode of reproduction; and hence these latter naturalists regarded them as occupying a position intermediate between birds, reptiles, and mammals. And finally, after more careful and detailed examination of their structure, De Blainville, Meckel, and other zoologists recognized their true Mammalian characters, and placed them in that class, assigning to them a place near the Marsupialia—an order represented by the kangaroos, &c. In size the Ornithorhynchus resembles a small otter. Its body is covered by a thick short fur of brown colour. The tail is short and flat. Anteriorly the jaws are prolonged to form a broad bill, resembling that of a duck in conformation, and on the upper surface of this bill the nostrils open. No distinct teeth exist, the jaws being invested by horny sheaths, and four horny processes appear to take the place of true teeth. The legs are shortened, the feet possessing each five toes, which are united by a web or membrane, enabling the animal to swim with great ease. The toes are terminated by claws, of service to the Ornithorhynchus in its burrowing operations. The skeleton presents several points of peculiar interest and divergence from the ordinary Mammalian type. The skull is essentially bird-like in conformation, the cranial bones being firmly united at an early period so as to render the sutures or lines of union indistinct. The bones of the shoulder-girdle are differently arranged from those of all other mammals. The coracoid bones—which are mere processes of the shoulder-blade in other mammals—are largely developed, and form as in birds the chief support of the upper limb; and an 'interclavicle' or T-shaped bone, having no representative in other mammals, is developed as an upward prolongation of the breast-bone, and bears on its arms the united splint-like clavicles or collar-bones. This disposition of parts also recalls to mind the arrangement of the shoulder-girdle in the bird. The angle of the lower jaw is not inflected.

The eyes are small, and an outer or external ear is wholly wanting. The male Ornithorhynchi bear on each of their tarsi or hind legs a spur-like structure, which is perforated, and communicates internally with a glandular or secretory organ—a disposition of parts resembling that of a poison or offensive apparatus. It does not, however, appear that this organ is ever used in the offensive or defensive interests of the animal. Even when irritated these animals show no disposition to use this apparatus, and hence some zoologists have assigned to it the function of stimulating the sexual instincts of these forms rather than that of an offensive structure. The hemispheres of the brain are smooth and destitute of convolutions. Marsupial bones exist, but these structures never support a pouch as in the kangaroos, &c. The food of the Ornithorhynchus consists of insects, larvæ, &c. It excavates a nest or habitation at some distance from the banks of rivers, a burrow or tunnel placing the nest in communication with the water in which it swims and hunts for food. The young are born blind and hairless, the jaws being at first of soft conformation, and the tongue situated nearer the front of the mouth than in the adult—a structure no doubt connected with the nutrition of the immature form. The milk appears to be pressed from the glands (which are destitute of nipples) by the action of a special muscle. (See Pl. CXXI.–CXXII. fig. 15.)

OROBANCHACEÆ, the Broom-rape family. The general properties of this family of plants are astringency and bitterness. The calyx is divided, persistent, inferior; the corolla hypogynous, irregular, persistent, æstivation imbricated; stamens, four; ovary free, one-celled, with two carpels; style, one; stigma two-lobed, divided transversely to the carpels; fruit capsular. The Orobanchaceæ are herbaceous parasites, with scales in place of leaves. They attach themselves to the roots of different plants, and have received the name of broom-rapes from the ravages

they are supposed to commit among plants of the broom family. The different species attach themselves to different plants, as the *Orobanche major* to broom and furze, *Orobanche ramosa* to hemp, *Orobanche rubra* to thyme, *Orobanche hederæ* to ivy. The central cellular portion of the stems of the Orobanchaceæ is surrounded by fibro-vascular bundles, which connect themselves with those of the plants to which they attach themselves. They have also tubers and ordinary roots, from which it is supposed they may derive nourishment from the soil. See CANCER-ROOT.

OROGRAPHY (from Greek, *oros*, a mountain, and *graphō*, I write), the description of mountains, their chains, branches, &c. The most ancient, and perhaps the most accurate, method of measuring the heights of mountains is by trigonometrical survey. The great difficulty to be encountered in this method of measurement arises from the optical delusion occasioned by the different states of the density of the atmosphere, causing a proportionate change of refraction, which may, however, be corrected by hygrometric observation. In modern times it has been usual to ascertain the heights of mountains by barometrical observation, as being much more convenient and sufficiently correct for all practical purposes. There is a proportionate relation between the height of the mercury in the barometer and the altitude of the point of observation, which may guide in ascertaining within certain limits the acclivities and declivities of any line of travel, so that by observing the rises and falls in the barometer, and noting the distances, an outline may be obtained of the profile of the tract. Corrections have to be made for variations of temperature, humidity, and latitude, for ascertaining which many experiments have been made, and formulæ deduced for the guidance of the observer. See HEIGHTS (MEASUREMENT OF.)

ORONOKO. See ORINOCO.

ORONTES (Syrian, *Aasi* or *Nahir-el-asy*), a river of Syria, rising on the east of the Anti-Libanus, in a natural basin of rock. It flows north through the plain of Hamah to the Lake of Antioch, whose waters it receives, and thence south-west into the Mediterranean. Its entire course is about 200 miles. It receives some rivers and forms some lakes on its course, and its overflowings contribute much to the fertility of the land. It is not navigable at present, owing to a bar at its mouth, but it abounds with fish, especially eels.

OROTAVA, a town in the Canary Islands, in the north-west of the island of Tenerife, formerly the capital and court of the principal kingdom of the Guanches. It is regularly built, and the streets are arranged in the form of an amphitheatre. It has an hospital, two primary schools, two parish churches, one of them a beautiful edifice with three naves, containing a magnificent marble tabernacle brought from Genoa; nineteen hermitages, and, in a delicious valley east of the town, a botanic garden, established for acclimatizing the plants of America, and then transplanting them to Spain. Orotava is the native place of the poet Iriarte. Pop. 3228.

ORPHAN ASYLUMS, establishments in which orphans who have not relations able to support them are provided for and educated. The care which society at large is bound to take of destitute orphans is in many countries considered as an important point of political economy. The question of most consequence in relation to the public support of orphans, is, whether it is best, in a moral, physical, and economical point of view, to bring up large numbers of orphans in great establishments, where they live together; or to put them out singly in trustworthy families, paid by the community. In Germany this question has been long and thoroughly discussed; and it appears that the majority of persons in that country conversant with the subject prefer the plan of bringing them up in separate families. This plan has also been tried with success in Switzerland. Both systems have their inconveniences and advantages. It would appear to be cheaper, as well as better for the morals of orphans, to educate them in separate families; and in the way in which asylums have been generally conducted on the continent of Europe, the health of the children has appeared not to be so well taken care of as in families. Some asylums, however, form brilliant exceptions, as the great asylum at Potsdam, near Berlin. The history of the origin of orphan asylums is uncertain. What the Romans understood by *pueri* and *puellæ alimentarii* cannot properly be compared to our publicly supported orphans. Trajan, who did much in favour of orphans, both the Antonines, and Alexander Severus established foundations for them; but such institutions do not seem to have become frequent till the introduction of the Christian religion. In the middle ages, however, in which so many institutions beneficial to mankind originated within the walls of thriving and opulent cities, orphan asylums became frequent in such places, particularly in the larger commercial towns of the Netherlands. In Germany the first asylums are found in the free cities, yet their origin does not go beyond the sixteenth century. One of the most famous asylums in the world is that established by A. H. Francke at Halle in 1698. There are also some considerable orphanages in Italy, and in France they are very numerous. In Britain there are few asylums exclusively appropriated to orphans, these being generally disposed of in poor-houses, &c.

ORPHEUS, a personage of great importance in the legends and mythology of Greece. He is not mentioned at all in Homer and Hesiod, but appears in the lyric period, and becomes rapidly surrounded by a multitude of celebrated and highly suggestive legends. These legends not only as usual assume a great variety of forms, but there is in them a break which is difficult to account for. In the earlier legends Orpheus is invariably associated with Apollo and the Muses. He is even represented as the despiser of Dionysus, who in anger at his preference of the worship of Apollo, causes him to be torn to pieces by the Bassaridae, or frantic bacchanalian women. This story, according to Eratosthenes, was told by Æschylus in one of his lost plays. It is added that he was buried by the Muses at Leibethra, at the foot of Mount Olympus, and according to one account his lyre was taken to Lesbos, while according to another it was raised to a place amongst the stars. In the later accounts Orpheus is so closely associated with the worship of Dionysus as to become in some sort the prophet and founder of an entire system of Dionysan rites. To Orpheus is attributed the application of music to the worship of the gods, and in this fact may be found perhaps the cause of a discordance which has been held to be inexplicable. The jealousy of Dionysus may be supposed to be excited by a sensuous form of worship more pure and ethereal than his accustomed rites; but ultimately this higher form of sensuous excitement is used to refine and purify the worship of Dionysus himself.

According to earlier accounts Orpheus was one of the earliest pupils of Apollo and the Muses. The earlier legends, however, contain comparatively few incidents regarding him, and the greater marvels of his career are of later growth. Pindar names him among the Argonauts. Æschylus mentions his drawing the trees after him by the charms of his lyre. This instrument is invariably associated with Orpheus in the earlier legends. In the Dionysan period he is armed with a flute. Euripides first connects him

with Dionysus, and mentions his journey to the infernal regions. He ascribed to him the origin of Dionysan mysteries, the scene of which he places in the forests of Olympus. Plato interprets his visit to Hades after a manner of his own. He makes the failure of his mission a punishment for his cowardice in refusing to die in order to follow his wife, and assigns the same reason for his death at the hands of the Thracian women. Plato refers to writings of Orpheus, and makes it one of his doctrines that the soul is imprisoned in the body in punishment of former sins. Aristotle did not believe in the existence of Orpheus, and held his assumed writings to be forgeries of Cercops and Onomacritus.

According to the later developments of the story Orpheus was the son of Oeagrus and Calliope. He lived in Thrace at the period of the Argonauts, and accompanied them on their expedition. Apollo presented him with his lyre, and the Muses instructed him to use it, so that he moved not the beasts only, but the woods and rocks with its melody. His music contributed in many wonderful ways to the success of the expedition. On his return he took up his abode in a cave in Thrace, and occupied himself in civilizing the inhabitants. He is also said to have visited Egypt. Among the legends of which the reports are most diversified is the story of his losing his wife, whose name was Agriope or Eurydice, and going to Hades to seek her. (See EURYDICE.) His grief when he returned unsuccessful from this mission excited the jealousy of the Thracian women, whom he treated with contempt, and excited them to such rage that they tore him to pieces in one of their bacchanalian orgies.

Societies taking their name from Orpheus began to be formed about the period of the commencement of Greek philosophy. They practised a mystical worship, attached to no particular temple, and promulgated their views in literary works. Their devotions were addressed to Dionysus Zagreus, in whom they idealized the conception of intense sorrow for human misery. He was an infernal deity, who was to purify the soul and make it immortal. The worship was ascetic, and aimed at purity. The sacrificial rite consisted in partaking of raw flesh torn from the ox of Dionysus, and those who had participated in it afterwards ate no other animal food. The earliest authors who expounded their doctrines were Pherecydes and Onomacritus. One sect of them held a doctrine curiously like that of indulgences. They offered by sacrifices and songs to procure for the rich pardon for their own sins and for those of their ancestors.

The bulk of the poems attributed to Orpheus in modern times have been proved to be forgeries of Christian grammarians of the Alexandrian school. A portion of them, however, belong to the time of Onomacritus, or earlier, and include hymns, a theogony, a poem called Minyas, or the Descent into Hades; oracles and songs for initiation, and sacred legends. Among those who have investigated the Orphic writings are Ottfried Müller, Grote, and Lobeck.

ORPIMENT. When yellow sulphide of arsenic, As_2S_3, occurs native it is called orpiment. This mineral forms translucent rhombic trimetric prisms of lemon-yellow colour; specific gravity, 3·45. Orpiment was formerly used as a pigment under the name of *king's-yellow*, but it is now nearly superseded by chrome-yellow. It is very poisonous.

ORRERY, an instrument for representing the motions of the planets, &c. Although Sir John Herschel remarked that orreries are 'very childish toys,' it may reasonably be questioned if some such help is not required by non-mathematical persons in acquiring the fundamental notions of astronomy. The clock-work being hidden, and the observers being really students, a good lecturer can make great use of an orrery.

ORRERY, CHARLES BOYLE, EARL OF, second son of Roger, earl of Orrery, was born in 1676 at Chelsea, and at fifteen entered at Christ Church, Oxford. While there he published a new edition of the epistles of Phalaris, of which Dr. Bentley questioning the authenticity, he wrote an answer entitled Doctor Bentley's Dissertation on the Epistles of Phalaris Examined, which produced the controversy with Dr. Bentley. (See BENTLEY, RICHARD.) On the death of his brother he succeeded to the earldom, and in 1709 was sworn of the queen's privy-council. He was also envoy extraordinary from the queen to the states of Flanders and Brabant at the critical period of the Treaty of Utrecht, and on his return was raised to the dignity of a British peer, under the title of Lord Boyle. He retired from court soon after the accession of George I., and in 1722 was sent to the Tower on suspicion of being concerned in Layer's plot, but was discharged after six months' imprisonment. Besides the edition of Phalaris he published a comedy, called As you Find It, and some verses. He died in 1731. His name has been given to a well-known astronomical instrument invented by Graham. See ORRERY.

ORRIS (or IRIS) ROOT, the rhizome or underground stem of a white flowering species of iris, the *I. Florentina*, a native of the south of Europe. In a dried state it is well known on account of its communicating a grateful odour, resembling that of violets. It was formerly much employed in medicine, but is now little valued except as a perfume. It is exported from the Mediterranean in considerable quantities, and, among other uses, is employed in the manufacture of tooth-powder.

ORSINI, one of the most illustrious and powerful families of Italy, celebrated for its rivalry with the Colonna family. It became known about the eleventh century, and had already acquired a high rank among the nobility of the Papal States by the extent of its possessions, the number of its vassals and of its fortresses, when one of its members, Giovanni Gaetano, was raised to the pontificate under the title of Nicholas III. (1277–80). The rivalship between the Orsini and the Colonna commenced in the pontificate of Boniface VIII., towards the close of the thirteenth century, and became further embittered with the progress of time. During the sojourn of the popes at Avignon Rome was a prey to the jealousies and ambition of the rival barons, and the Orsini had their full share in the violence of the unseemly struggle. Many of them embraced the profession of condottieri, and several of these distinguished themselves on the revival of the military art. Raimondo, who acquired in 1399 the principality of Tarento; Bertoldo, a captain in the service of Florence; Giovanni Antonio, who made himself master of Tarento in 1419, and held it till his death in 1463; Niccolo, count of Pitigliano, in the service of Venice (1502–10), are among the most conspicuous instances. Alexander VI. and his son, Cæsar Borgia, laboured to abase the Orsini family, and caused the assassination of several of its members. Lorenzo Orsini (Renzo de Ceri) entered the service of Venice in 1508, distinguished himself in the siege of Bergamo in 1514; in the following year passed into the service of Leo X., and took part in the conquest of Urbino. He afterwards entered the service of Francis I., and distinguished himself in the defence of Marseilles (1524) and Rome (1527) against the Constable de Bourbon. He died in 1536. Fulvio Orsini, an antiquary and philologist, born at Rome 1529, died there 1600, left among other collec-

tions a work on the Roman families, Familiæ Romanæ, 1577. Vincenzo Marco Orsini (Benedict XIII.) succeeded Innocent XIII. in 1724. (See BENEDICT.) The Orsini family is now divided into two branches, the Orsini-Gravina at Rome and the Orsini of Piedmont.

ORSINI, FELICE, an Italian revolutionist, was born at Meldola, near Forli, in 1819. He was the son of an ardent patriot who inculcated on him the hatred of the enemies of his country. In 1838 he was sent to the University of Bologna, where he studied law. He affiliated himself to the Society of Young Italy, formed in 1831 by Mazzini, exercised himself in arms, and devoted himself to the struggle against the oppressive governments which then dominated Italy. In 1843 he took an active part in the insurrection which took place in the legation of Bologna, and being apprehended along with his father, was sentenced (Dec. 1844) to the galleys for life. On the accession of Pio Nono he partook in the general amnesty of political prisoners (16th July, 1846), of whom more than 2000 were liberated. On his liberation he with the other prisoners had to sign a declaration promising no more to disturb public order or to do anything against the legitimate government. When accused of subsequent breaches of this promise, he alleged that it was the pope who had broken his engagements, and that the government he attacked was not legitimate. He at first retired into Florence, and took an active part in the political intrigues going on there under the conduct of Mazzini. In 1848 he entered the service of the Venetian Republic, and fought as captain of battalion in several engagements. On the outbreak of the revolution in Rome he repaired to Bologna with his battalion. He was a member of the Roman constituent assembly in 1849. On the surrender of Rome he took refuge first at Genoa and afterwards at Nice. He now became one of the most active agents of Mazzini, and engaged in numerous abortive efforts at insurrection in various parts of Italy. He was once apprehended and dismissed after a short imprisonment. A second apprehension took place during a journey through Hungary. He was tried at Mantua as an inveterate conspirator and condemned to death, 20th August, 1855. The sentence was not executed, and in March, 1856, he escaped from prison, and reached London on 26th May. Here he wrote his work Austrian Dungeons in Italy (1856), and lived by giving lectures on his adventures. At this time he had a disagreement with Mazzini, and separated himself from his former leader. He now planned the assassination of Napoleon III., whom he regarded as the main prop of reactionary tendencies in Europe. He at first determined to execute his project alone, but ultimately associated with himself three Italian refugees, Rudio, Gomez, and Pieri. Another person, Simon Francis Bernard, was accused of complicity in the plot and tried and condemned at Paris, but was acquitted at the Old Bailey. The attempt was made on 14th January, 1858, as the emperor and empress were leaving the opera, by the explosion of fulminating bombs, which injured many persons, of whom some died, and killed one of the horses of the imperial equipage. All the conspirators were arrested. Pieri, Rudio, and Orsini were condemned to death. In the case of Gomez extenuating circumstances were found, and he was condemned to hard labour for life. At the last moment Rudio had his penalty commuted; but Pieri and Orsini, the latter of whom openly avowed himself on his trial as the author of the plot, were executed on 13th March, 1858. While in prison he addressed a letter to the emperor in favour of the liberty of Italy.

ORSTED, HANS CHRISTIAN, one of the most eminent philosophers of modern times, was born in 1777 at Rudkjobing on the island of Langeland, where his father was an apothecary. He early displayed a great thirst for knowledge, but owing to the very imperfect state of education in his native town could find few means of gratifying it. In 1794 he went to study at the University of Copenhagen, and after obtaining his degree was in 1800 appointed adjunct of the medical faculty. He also undertook the management of an apothecary's shop, and delivered lectures on chemistry and natural metaphysics. Having formed a friendship with Öhlenschläger, he, by intercourse with him, was induced to take a lively interest in poetry and belles-lettres, which he, however, abandoned at a later period. From 1801–4 he travelled, at the expense of government, over Holland and a great part of Germany, and spent a year in Paris. After his return he was, after a temporary appointment, created in 1806 extraordinary professor of physics. In 1812 and 1813 he again made an extensive tour through Germany, and in Berlin drew up his views of the chemical laws of nature, which he afterwards, with the assistance of Marcel de Serres, published in Paris under the title of Recherches sur l'identité des forces électriques et chimiques. His Tentamen Nomenclaturæ Chemicæ omnibus linguis Scandinavico-Germanicis Communis appeared in 1815, and to him was owing the foundation of the Society for the Diffusion of Natural Knowledge, which delivers lectures in the different towns of Denmark. In 1829 he was named director of the Polytechnic School of Copenhagen, to the erection of which he had mainly contributed. Since 1839 he took an active interest in the meetings of the Scandinavian naturalists. In 1850, on the occasion of his jubilee festival, he was appointed a privy-councillor. He died in 1851. In the first years of this century he had acquired an honourable name among natural philosophers by his researches in regard to the voltaic pile, and by several discoveries concerning sound, light, the law of Mariotte, &c.; but his fame first became diffused over the scientific world in 1819 by his discovery of the fundamental principles of electro-magnetism, which he explained in a work entitled Experimenta circa Efficaciam Conflictus Electrici in Acum Magneticam. An account of most of his other physical and chemical labours is given in Poggendorf's Annals. It was ever his aim to diffuse the benefits of his meditations in all circles, orally by solid lectures, or in writing by a series of valuable and yet popular works, which have met with the greatest acceptance both at home and abroad. Among these may be mentioned Natur-Lärens mechaniske Deel (Copenhagen, 1844; in German, Brunswick, 1851); To Capitler af det Skjonnes Naturläre (Copenhagen, 1845; German, Hamburg, 1845); and above all Aanden i Naturen (Copenhagen, 1850; German, 4th edition, Leipzig, 1852). In all his works, of which a beautiful edition in nine vols. was published at Copenhagen, 1850–51, under the title of Samlede og efterladte Skrifter, there reigns a peculiarly fascinating and instructive tone, with beautifully-chosen and delicately-employed poetic colouring. Besides logical acuteness and great skill and eloquence in the management both of his dialogue and his polemical discussions, are displayed a noble religious warmth, a vigorous freshness, and an unsophisticated, unassuming manner, which have made his works very popular.

ORTHEZ, a town, France, department of Basses-Pyrénées, 24 miles north-west of Pau, on a hill above the Gave-de-Pau, here crossed by an old Gothic bridge. It has been recently much improved, and has an ancient parish church, a handsome town-house,

and an old castle where the princes of Béarn used to reside. Soult was here defeated by Wellington, 27th February, 1814. Pop. (1881), 6556.

ORTHITE, a silicate of aluminium containing the rare metals cerium, lanthanum, didymium, and yttrium, occurring in granite and other rocks in Norway, Sweden, Greenland, the Ural, &c. This mineral forms brownish-black or yellowish monoclinic prisms; it is brittle, breaking with an uneven fracture. The name is derived from the Greek *orthos*, straight, because it always occurs in straight layers.

ORTHOCLASE. This important mineral, called also common or potash felspar, is widely distributed. In Italy, Silesia, Bohemia, Norway, Cornwall, &c., it is found in fine monoclinic crystals disseminated throughout the older rocks. Orthoclase is a silicate of aluminium and potassium, agreeing in composition with the general formula $K_2O.Al_2O_3.6SiO_2$. In some specimens the greater part of the potash is replaced by soda. The colour of orthoclase varies from white to green; it is transparent or translucent; specific gravity, 2·4 to 2·6; hardness, 6. Many varieties occur. By the action of water containing carbonic acid orthoclase is decomposed, with the removal of the alkali and the formation of silicates of aluminium, or clays.

ORTHODOX (from the Greek *orthodoxos*, from *orthos*, right, and *doxa*, opinion) may be used in regard to any speculative opinion, when it signifies the opposite of heterodox (which see), and is generally applied to what is regarded as the established opinion, or that which is commonly considered as right. Its chief use is in religious controversies, when it signifies what is not opposed to the doctrine of a particular established or prevalent church, or to the creed recognized by a particular church or churches, or opposed to the doctrines taught in or fairly deduced from Scripture.

ORTHOGRAPHIC PROJECTION. See MAP.

ORTHOGRAPHY, that part of grammar which teaches the nature and properties of letters, and the just method of spelling or writing words, making one of the four greatest divisions or branches of grammar.

ORTHOPÆDIA (Greek, *orthos*, straight, and *pais*, genit. *paidos*, a child), a branch of medical science relating to the cure of natural deformities. Orthopædia is not, as the name implies, restricted to the treatment of such cases in children, although childhood is usually the time most favourable to their treatment. Orthopædia is at least as old as the period of the Hippocratic collection of writings, in which (*de articulis*) there is an account of two processes for correcting a deviation of the vertebral column. Until recent times, however, it received comparatively little attention. In 1741 a treatise was written on the subject by Andry, which called attention to some of the difficulties to be encountered in grappling with it; and a short time afterwards Levacher invented the first apparatus for continuous extension, and demonstrated the advantage to be derived from such applications in the treatment of deviation of bones. There are deformities originating both before and after birth, to which orthopædic treatment cannot be safely applied. Such are cerebral hernia, hydrocephalus, spina bifida, the angular curvatures of rickets, complete anchylosis of the articulations, &c.

Orthopædia is divided into two classes: prophylactic, or preventive, and curative. The object of the first is to prevent deformities in children, who, from the delicacy of their constitution, are exposed to them. Its means are hygienic; and its aim is to aid by natural means the symmetrical development of the body. Among these means one of the most important is pure air. Children have been known to recover from an incipient deformity of the spine or members merely by being sent to the country. The compressed-air bath has been used with success as an auxiliary in this branch of treatment. Muscular exercise methodically applied is another resource of great importance. It has the advantage not only of developing the muscles, but of aiding digestion and secretion. It is necessary in this, however, carefully to avoid all excess. Curative orthopædia has been applied with success to a great variety of malformations both of the spine and members which we cannot here treat of in detail. The manufacture of apparatus for the mechanical treatment of deformities has become a complete branch of trade; and there are, particularly in Germany, numerous institutions where such cases are systematically treated.

ORTHOPTERA (Greek, *orthos*, straight; *pteron*, a wing), an order of Hemimetabolic Insects, distinguished by the possession of a masticatory mouth, by the presence of four wings—wanting in a few instances—of which the hinder pair are generally the larger, the front pair being of leathery texture and usually forming sheaths or protective cases for the membranous and functionally useful hinder pair. Both pairs of wings are supported by net-work or reticulated nervures, and the front wings generally overlap one another in a horizontal manner, as seen in the Cockroaches; or in an imbricated manner, as in the Grasshoppers. The hinder wings when at rest are folded in fan-like fashion, the nervures of these latter wings being distributed from a central point in a straight manner to the circumference. The feelers are generally straight, filiform organs. The limbs vary in conformation. In the Cockroaches, representing the Cursorial or Running Orthoptera, the legs are nearly of equal size. In the Saltatorial or Leaping Orthoptera, as in the Grasshoppers and Crickets, the hinder limbs are greatly elongated so as to fit these forms for executing leaping movements. In the Mantis (which see) the fore limbs are converted into powerful raptorial organs. In their metamorphosis the larvæ and pupæ are both active, and the pupa generally resembles the perfect insect, differing from it chiefly in the absence of the adult wings, which begin to be developed in the pupa or nymph. Some of the Locustina want wings entirely. In habits most of the Orthoptera are voracious and destructive to plant-growth, the Locusts and allied forms exemplifying insect-pests of this description. These insects are divided into Running (Cursorial) and Leaping (Saltatorial) Orthoptera. Of the former division the Cockroaches (*Blattina*), Earwigs (*Forficulina*), Mantis Insects (*Mantina*), Walking-stick Insects and Walking Leaves (*Phasmina*) form the chief families. The Saltatoria are represented by the Locusts (*Locustina*), Crickets (*Achetina*), and Grasshoppers (*Gryllina*). In some forms (for example, Grasshoppers and Crickets) sounds are produced by the friction of the limbs and wing-covers, the 'chirp' of the cricket being produced in this way. See also INSECTA and ENTOMOLOGY.

ORTLER-SPITZE, or ORTLER, a mountain in Tyrol, on the borders of the Engadin. It is about 12,400 feet high, and, after the Glockner, the loftiest summit in Germany. Its summit was first reached in 1802.

ORTOLAN (*Emberiza hortulana*), a bird belonging to the sub-order Conirostres of the order of Insessorial or Perching Birds. It forms a typical member of the *Emberizinæ* or Bunting sub-family, the members of which are closely allied to the Finches. The ortolans abound in Southern Europe, but also occur in England, Sweden, and the more northern portions of the Continent. It is famous in the annals of gastronomy as forming a dainty dish. These birds are caught in large numbers at the commencement of the autumn

season, and are fed for some time on a dietary chiefly consisting of corn and millet-seed. On this food they grow amazingly fat, the process of fattening being said to be favoured by their being fed in darkened rooms. The flesh is said to be exceedingly delicate, but of so rich a character that it very soon satiates the appetite. The favourite method of preparing the ortolans for table consists in roasting them in egg-shells—a mode of cookery borrowed from the ancients. In former times the island of Cyprus formed a chief depôt for the exportation of these birds, which were pickled in spices and vinegar and packed in casks containing from 300 to 400 each. From 400 to 500 casks is stated as the number annually exported from Cyprus in past years. The ortolan appears to be identical with the Miliaria of Varro, which was sold at enormous prices to the epicures of ancient Rome. In its natural state the food of the ortolan consists of seeds and insects, and even when left to themselves these birds at the close of the autumn become very plump and well-favoured after feeding on the grains of the fields. The nests are built on bushes or trees of moderate height. The song is not of a powerful character. The colours are yellow on the throat and around the eyes, the breast and belly being of reddish hue, whilst the upper part of the body is brown varied with black.

ORTONA (Italian, *Ortona a Mare*), a town and seaport in Italy, Naples, in the province of Chieti, on the Adriatic, 11 miles east of Chieti. It has a cathedral, and several other churches and convents. Its port, at one time extensive, has ceased to exist, and vessels are obliged to anchor above a mile from the shore, in roads with ample depth of water and a good bottom, but badly sheltered. A great deal of wine is made in the neighbourhood. Pop. 11,884.

ORURO, a town of Bolivia, capital of a department of the same name, on a bleak hill in a metalliferous district, at an absolute height of 13,000 feet, is now surrounded by ruins owing to the decline of the population, which is reduced to 7980, or a fifth of its former amount.—The department, lying between Peru on the west, the departments of La Paz and Cochabamba on the north, and Potosi on the south and east, has an area of 25,160 square miles, and a pop. of 110,931.

ORVIETO, a town of Italy, in the province of Umbria, 60 miles N.N.W. of Rome. It stands on a steep hill near the junction of the Paglia and Chiana, is walled and well built, and has several fine palaces. The cathedral, built of black and white marble, and adorned with fine sculptures and paintings, is a beautiful specimen of Italian Gothic; both the episcopal palace and the Jesuit college are handsome, and the palaces Petrungeli and Gualtieri deserve special notice, the former for its fine collection of paintings, and the latter for its cartoons by Domenichino, Annibale Caracci, and other eminent masters. Pop. 7423.

ORYCTEROPUS, the generic name of the 'Aardvark,' 'Cape Pig,' or 'Ground Hog' (*O. Capensis*) of the Cape of Good Hope and South Africa generally. This animal is included in the order of Edentate mammals, and it forms the sole representative of the family Orycteropidæ. The average length is from 3 to 4 feet. The fur consists of a coating of bristly hairs, which are more numerous on the elongated tail. The limbs are short, the front feet possessing four and the hinder five toes, furnished with claw-like nails, by means of which these animals burrow in the ground. The only teeth possessed by this animal are molars, which number seven in each side of the upper and six in each side of the lower jaw. An elongated tongue exists, by means of which the insect-prey are seized. The ears are long and pointed, and the snout terminates abruptly. In habits the aardvark is nocturnal. In structure this animal may be considered somewhat intermediate between the ant-eaters and armadillos.

ORYX, the name of the genus of antelopes represented by the addax (*Oryx nasomaculata*) and by other species, found chiefly in the northern portions of the African continent. These antelopes are of comparatively large size. They live in large herds. The horns are very long, and are developed each to form a symmetrically spiral structure. The addax appears to have been represented on Egyptian monuments and in ancient inscriptions. The Gems-boc (*Oryx Gazella*) is another species included in this genus.

OS, VAN, the name of several eminent Dutch painters.—1. JAN VAN, who was born at Middelharnis in 1744, and died in 1808, is particularly celebrated as a painter of fruit and flowers. His best studies were made for the cabinet of his friend H. Verschuring. His pictures soon rose in reputation and price, and found a place in the most important galleries. He is known as a successful imitator of Huysum. The poet Spex in his verses celebrates not only the flowers of this artist, but also his marine and sea-coast pieces. Os was himself a poet, and published a small volume of poems (Hague, 1787).——2. PIETER GERARDUS VAN, son of the former, was born at the Hague in 1776, and educated at first by his father. Then, having an inclination for animal-painting, he selected Paul Potter and Karel Dujardin for his models, and imitated them with such success that his copies are often placed in galleries beside the genuine works of these masters. His favourite pieces were landscapes with cattle of all kinds, which he executed with so much correctness of design and healthy colouring that his fame soon spread over Europe. His position as a volunteer in the campaigns of 1813–14 made him acquainted with war-scenes, several of which, executed by his hand, are in the Royal Museum at Amsterdam. After the peace he returned to his studio, and executed a great number of works, which are held in high estimation. He also engraved and produced several excellent plates, particularly of cattle-pieces. After living for a long time at Graveland and Hilversum, he died in 1839.——3. GEORGE JACOBUS JOHANNES VAN, younger brother of the former, born at the Hague in 1782, also received his first education from his father, and remained devoted to his particular branch of art, flower-painting. He drew most of the plants in the Flora Batava, by J. Kops, gained a prize in Amsterdam, set up next year for himself, and began for the first time to paint in oil. In a very short time he had the most brilliant success, selecting the great master Huysum for his model. In 1812 he went to Paris, gained a prize there, and painted many things for the china manufacture of Sevres. During a short return to Amsterdam in 1816 he adorned many of the establishments there with beautiful flower-pieces. In 1817 he resumed his employment in the Sevres manufactory, and painted many beautiful vases and other articles, without, however, neglecting oil-painting. The French, in their admiration, gave him the surname of the Rubens of flower-painting. At a sale in Amsterdam in 1850 one of his pieces sold for 4500 guilders. He also drew landscapes. He died 11th July, 1861.

OSAGE, a large river in the United States of America, which rises in the state of Kansas, and flows in an easterly direction, receiving many affluents. It enters the state of Missouri, and after a winding course, estimated at from 350 to 500 miles, joins the Missouri 10 miles below Jefferson City. It is navigable for boats for about 200 miles.

OSAGE ORANGE (*Macclura aurantiaca*), a tree of the natural order Moraceæ, indigenous to North

America. It belongs to the same genus as fustic, which it resembles in the colour of its wood. It has a fine-grained, elastic wood, which is used by the Indians for making bows. It has a large fruit with a yellow juice; but the fibre of the fruit is woody, and the flavour of the juice not agreeable.

OSAKA, or OHOSAKA, a city and open port of Japan, in the island of Niphon, on the estuary of the Yeddo Gawa, 28 miles S.S.W. of Miako. It is intersected by fifteen canals, which are spanned by over 160 wooden bridges, cumbrous but strong structures. The banks of the main river are lined for 2 or 3 miles with the residences of the nobles, which give an idea of wealth and importance. It has a strong citadel. A railway, which is intended to be continued ultimately to Yeddo, has been partly constructed and opened for traffic. By much the greater part of its foreign trade is carried on at Hiogo, on the opposite side of the estuary, which town may be regarded as the port of Osaka. The value of the total foreign imports at Hiogo in 1882 was £1,275,357; exports, £1,269,115; at Osaka, imports, £308,202; exports, £83,218. Pop. (1881), 293,686.

OSCAR I. (JOSEPH FRANÇOIS BERNADOTTE), King of Sweden and Norway, was born at Paris in 1799. He was educated at the Lycée Louis le Grand. After his father had been chosen Prince-Royal of Sweden he joined him in that country, and was, 31st Jan. 1811, proclaimed Duke of Sudermania. The charge of his education was then confided to Baron Cederhjelm. Among his preceptors were Berzelius and the poet Atterborn. He made rapid progress in his studies, and soon acquired the command of Swedish. At the age of fifteen he took part in the suppression of an insurrection in Norway, which Denmark had recently ceded to Sweden. In 1817 he was proclaimed major; and in 1823 he married Joséphine, eldest daughter of Prince Eugène Beauharnais. During the reign of his father he was three times, in 1824, 1828, and 1833, viceroy of Norway, where he made himself popular by his good administration. He afterwards continued to study in retirement until the death of his father, 4th March, 1844, the social and political questions of the day. On his accession to the throne he immediately commenced a series of political reforms amounting to a social revolution. He abolished the proscription which was in force against the ex-reigning family, introduced reforms in education, the civil and military administration of the state, and in legislation, including the abolition of primogeniture, and the extension to females of an equal right in territorial succession, the withdrawal from the crown of the right of suppressing newspapers, and the establishment of complete liberty of conscience. He abolished corporations in trade, and proclaimed liberty of commerce. He also encouraged agriculture by the formation of model farms and other measures. He promoted the establishment of railways and telegraphs, and other modern improvements. He put his kingdom in a state of defence; and although he took little part in foreign politics, he did not hesitate to protest in 1846 against the suppression of the Republic of Cracow. In 1855, during the Crimean war, he united with Denmark in a declaration of armed neutrality, and he also offered to join the allies against Russia on condition of their assisting him to reconquer Finland. He resigned the charge of the government in 1857 to his eldest son, and died in 1859. He wrote several works on political subjects, one of which, On Penal Laws and Establishments for Repression, has been translated into French and German. He also composed an opera, and various other pieces of music.

OSCI (Greek, *Opikoi*), an Italian people who appear to have been the original occupants, at the earliest known period, of Central Italy from Campania and the borders of Latium to the Adriatic. They were contiguous with the Œnotrians, a Pelasgian people on the south. The Oscans were subdued by the Sabines or Sabellians, a people from the Apennines on the north, of whose previous history little is known, and who probably adopted the language and customs of the conquered, with what modifications cannot be ascertained. The Oscan language was closely allied to the Latin, of which it was probably a parent stock. It appears to have been spoken in the provinces long after Latin became the official language, and it was used officially long after the Roman conquest. Some wall-inscriptions in it have been found in Pompeii. There are no remains of it except in coins and inscriptions. The principal remains of the latter kind are a bronze table, called the Tabula Bantina, referring to the municipal affairs of the town of Bantia; the Cippus Abellanus, containing a treaty between the cities of Nola and Abella; and a bronze tablet found at Agnone, in Northern Samnium, containing a dedication of sacred offerings. See Dr. Smith's Dictionary of Greek and Roman Geography, article Osci.

OSCILLATION, CENTRE OF. See CENTRE OF OSCILLATION.

OSCULATING PLANE. When all the points of a curve do not lie in one plane it is said to be 'tortuous.' Sometimes it is called a 'curve of double curvature;' but the use of this name is illogical, as a line has only one curvature (of which in a tortuous curve the *plane* is continually changing or twisting round the tangent line). The nature of tortuosity 'will be best understood by considering the curve as a polygon whose sides are indefinitely small. Any two consecutive sides, of course, lie in one plane, and in that plane the curvature is measured as above' (see CENTRE OF CURVATURE); 'but in a curve which is not plane the third side of the polygon will not be in the same plane with the first two, and therefore a new plane in which the curvature is to be measured is different from the old one. The plane of the curvature on each side of any point of a tortuous curve is sometimes called the *osculating plane* of the curve at that point. As two successive positions of it contain the second side of the polygon above mentioned, it is evident that the osculating plane passes from one position to the next by revolving about the tangent to the curve. Thus as we proceed along such a curve the curvature in general varies, and at the same time the plane in which the curvature lies is turning about the tangent to the curve. The rate of torsion, or the tortuosity, is therefore to be measured by the rate at which the osculating plane turns about the tangent per unit length of the curve. The simplest illustration of a tortuous curve is the thread of a screw' (sections 12 and 13, Thomson and Tait, El. of Nat. Phil.)

OSIANDER, ANDREAS (properly *Hosemann*), one of the most learned men of his time, and a zealous follower of Luther, born in 1498 at Gunzenburg, near Nürnberg, was educated at Ingolstadt and Wittenberg. As first evangelical preacher at Nürnberg, he exerted himself earnestly in furthering the Reformation, and displayed his zeal for Lutheranism by taking part against Zwinglius on the subject of the Lord's supper. He also took part in the conference at Marburg in 1529, and was present at the Diet of Augsburg in 1530. His refusal to consent to the Augsburg interim in 1548 cost him his situation at Augsburg. By Duke Albert of Prussia, on whom one of his sermons had at an early period produced a strong impression, he was invited to become preacher and first professor of theology in the newly-erected University of Königsberg, and was afterwards named

vice-president of the bishopric of Samland. Meanwhile, in 1549, he had become involved in a theological dispute, which was embittered by his obstinacy. In a discussion, De Lege et Evangelio, he maintained that justification is not a judicial or forensic act in God, but contained something of a subjective nature, as the imparting of an interior righteousness, brought about in a mystical manner by the union of Christ with men. One of his principal opponents was Martin Chemnitz. By the mediation of Duke Albert a peace had been effected between the parties in 1551, but the dissension was immediately renewed by Osiander in a work in which he all but directly named Melanchthon as the man by whom alone the pure doctrine had been corrupted. Though his views bordered on that of the Roman Catholics on the subject, and were condemned by several authorities, he continued to maintain them till his death, which took place in 1552. After his death the controversy continued to rage, till in 1556 all the Osiandrists were deposed. The Corpus Doctrinæ Prutenicum (1567) declared Osiandrism for ever banished out of Prussia, and also the Formula of Concord speaks out plainly against it. See Wilken's Andreas Osiander's Leben, Lehre und Schriften (Strasburg, 1844).—His son and grandson, LUCAS OSIANDER the Elder and the Younger, made some figure as theologians. The latter in particular, who was provost and chancellor at Tübingen, figured as a keen polemic in the controversy with the Giessen divines as to what was called the *Communicatio Idiomatum*. Towards the end of his life, in 1638, he is said to have recanted some of his ultra views.

OSIER. See WILLOW.

OSIRIS, one of the great Egyptian divinities. According to some authorities his name means son of Isis; according to others, 'full of eyes.' He was the brother and husband of Isis, and the father of Horus. He is styled the Manifestor of Good, Lord of Lords, King of the Gods, &c. In the Egyptian theogony he represented the sum of beneficent agencies, as Set of evil agencies. The struggle between these opposing agencies was thus personified in two individuals, as in the later theogony of Persia. Osiris, after having conquered all Egypt, and established good laws and institutions, fell a prey to the intrigues of his brother Set, the Typhon of the Greeks. He became afterwards the judge of the dead. There are a multitude of traditions, both Greek and Egyptian, about Osiris. He is represented under many different forms, and compared sometimes to the sun and sometimes to the Nile. In particular his soul was supposed to animate a sacred bull called Apis, and thus to be continually present among men; for when the bull Apis died the priests selected another, into which the divinity entered. Sometimes he is represented as a man crowned with a mitre, a globe, a lotus-flower, or an elephant's trunk; sometimes with the body of a man and the head of an ox, ibis, or other animal; sometimes he holds a stick, sometimes a phallus, in his hand. He holds, in some representations, a whip in one hand and a scourge in the other. He has frequently the horns of a bull. The name of Osiris was retained through many changes in the mythology of Egypt, due to their communications with African and Asiatic neighbours, and with the Greeks and Indians, hence many of the anomalies in the myths associated with it. The worship of Osiris was introduced into Rome, but the rites associated with his worship proceeded to such an excess of licentiousness that it was at length prohibited by law.

OSMAN. See CALIPH and OTTOMAN EMPIRE.

OSMELITE, called also *pectolite*, a white or grayish-white mineral which occurs in many localities in acicular monoclinic crystals, consisting of hydrated silicate of calcium and sodium. The general composition of this mineral agrees with the formula $(Na_2O.2SiO_2).4(CaO.SiO_2) + H_2O$.

OSMIUM (Os = 199), a metal discovered by Mr. Tennant in 1804 among platinum grains, and thus denominated by its discoverer from the pungent and peculiar smell of osmic acid. Metallic osmium forms a bluish-white, lustrous mass, having a density of 21·3 to 21·4. It may also be obtained in crystals, or as a black amorphous powder, which is very combustible. Osmium is the most infusible of all the metals. Exposed to a strong heat in a cavity in a piece of charcoal, it does not melt, nor is it volatile, if oxidation be carefully prevented. With copper and with gold it forms malleable alloys, which are easily dissolved in nitro-muriatic acid, and afford by distillation osmic acid. The pure metal, previously heated, does not appear to be acted upon by acids. Osmium forms three chlorides $OsCl_2$, $OsCl_3$, and $OsCl_4$, and five, or perhaps six, oxides, OsO, Os_2O_3, OsO_2, OsO_3, and OsO_4. The tetroxide, OsO_4, commonly called *osmic acid*, is formed when the metal is heated with aqua regia, and the product distilled. This oxide forms large crystals, which soften at the heat of the hand, and melt to a colourless liquid below 100° C. The vapours of this substance are extremely poisonous. Osmic acid acts as a powerful oxidizer, decarbonizing indigo, separating iodine from potassium iodide, converting alcohol into acetic acid, &c.

OSMOSE. When two different liquids which are capable of mixing together are separated by a thin porous partition, inorganic or organic, such as bladder, parchment-paper, or porous earthenware, they pass through the septum, diffusing into one another. This phenomenon is called osmose. The liquids pass through the septum at different rates. Thus if a bladder containing sugar as a syrup is partially immersed in water, seven parts by weight of water enter the bladder for one part of sugar passing out. The flow of the liquid which decreases in volume is called *endosmose*, the flow of the liquid which increases in volume is called *exosmose*. Of all vegetable substances sugar has the greatest power of endosmose, and of animal substances albumen has the greatest. Endosmose generally takes place towards the denser liquid; but alcohol and ether are exceptional substances, behaving like liquids denser than water. With water and acids more or less dilute, the endosmose is from the water or from the acid as the acid is more or less dilute. The osmose through inorganic septa is feeble, and may continue for a very long time; through organic septa it is more rapid, and is accompanied by decomposition of the septa. The following are some of Jolly's 'endosmotic equivalents' (numbers expressing the weights of water which osmose with unit weights of the substances). Jolly found that the endosmotic equivalent increases with the temperature, and also that the amount of osmose with water is proportional to the strength of the solution.

Common salt,	4·3	Caustic potash,	215·0
Epsom salts,	11·7	Sulphuric acid,	0·4
Sulphate of copper,	9·5	Alcohol,	4·2
Sugar,	7·1		

Osmose has by some been attributed to capillarity, and by others to unequal absorption of the liquids by the septum; but Graham showed that it was due to the chemical action of the fluids on the septum. In fact the corrosion of the septum seems necessary for the existence of osmose. Active chemical liquids osmose best. The chemical action must be different on the two sides of the septum; thus the osmose is great between caustic potash and sulphuric acid. Perhaps it is a chemical action of this sort which

causes the juices to rise and flow through the stems of plants. Osmose takes place between gases separated by a porous septum. Graham found that the rate at which a gas passed through the septum was inversely as the square root of its density. See DIFFUSION OF GASES.

Connected with the phenomena of diffusion and osmose are those of transpiration and absorption. The transpiration of liquids, or their flow under pressure through fine tubes, is found to vary as the pressure, as the fourth power of the diameter of the tube and inversely as the length of the tube. The flow seems to be uninfluenced by the nature of the tube. It depends on the nature of the liquid. The flow of a solution is less than the flow of water. A great increase in flow is produced by increase of temperature. No connection has been observed between the flow and density or capillarity or fluidity. The flow of a solution is greatly retarded by the presence of a small amount of colloid (see DIALYSIS) substance. The transpirability of different salts seems to follow their diffusability in water. The transpirability of a gas into a vacuum varies directly as the pressure, and inversely as the length of the tube. As the temperature rises the flow becomes less; it is independent of the material of the tube. All solid bodies, when surrounded by gases, tend to become covered with a more or less thick layer of condensed gas. This condensation may be observed when a porous body, which consequently possesses a very large surface in proportion to its bulk, is placed in a gas over mercury in a tube closed above. The quantity of gas absorbed depends somewhat on the chemical natures of the solid and the gas. Of all substances boxwood charcoal has the greatest absorbing power. This substance, at the ordinary temperature and pressure, absorbs ninety times its own bulk of ammonia. Meerschaum, gypsum, and silk are good absorbers. The absorbing power of spongy platinum for oxygen is well known.

OSMUNDA, a genus of ferns, of the order Osmundaceæ, with free capsules, opening by a longitudinal slit into two valves, no elastic ring, or instead of one a striated cup. The *Osmunda regalis*, or royal fern, is often cultivated as an ornamental plant on account of its elegant appearance. It has bipinnate fronds, and panicled spore-cases on separate stalks. It grows to a great height, and a mucilage is extracted from its roots, which is sometimes used as a starch.

OSNABRÜCK, or OSNABURG, a town of Prussia, in Hanover, on the Hase, and 71 miles west of Hanover. It is walled, and entered by five gates; in the old town the streets are narrow and the houses low; but the environs are pleasant, and covered with a number of fine villas. The buildings most deserving of notice are the Protestant churches of St. Catherine and St. Mary, the Roman Catholic cathedral and church of St. John; the Protestant and Roman Catholic gymnasiums, the old and new town-houses, the theatre, castle, normal school, barracks, infirmary, and several hospitals. It is the see of a bishop, the seat of several courts and public offices; and has iron and steel works, machine-shops, iron-foundries, wire-works, nail-works, tobacco factories, chemical-works; there are several paper-mills, bleach-fields, and tile-works, and a trade in linen, hams, and cattle. Osnabrück was erected into a see in 888; and in 1082 it was surrounded by walls. It afterwards entered the Hanseatic League, but never rose to be a free imperial city. The negotiations for the Peace of Westphalia, which ended the Thirty Years' war, were carried on here. The bishopric was secularized in 1803, and incorporated with Hanover. Pop. 32,812. The landdrostei or district of Osnabrück is bounded north by the landdrostei of Aurich and the duchy of Oldenburg, east and south by Rhenish Prussia, and west by Holland; area, 2304 square miles. It is subdivided into a number of minor jurisdictions, both rural and urban. The principality of Osnabrück occupies a portion of the district. Pop. (1881), 290,135.

OSPREY (*Falco* or *Pandion Haliaëtus*), a Raptorial bird included in the sub-family Aquilinæ or Eagles, which in turn forms a division of the large family Falconidæ or Hawks. The popular name of 'fish-hawk' has been applied to the osprey from its predatory habits as regards the finny tribes, the dietary of these birds consisting of fishes, which they capture by soaring over the water and by descending with great rapidity upon their prey appearing at the surface. The wings in this rapid descent are quickly closed or drawn to the sides of the body, and the fish is seized in the powerful talons, the bird shaking itself to rid its plumage of the moisture, and sailing gracefully towards the shore. The activity and grace of the osprey's movements have ever formed topics of interest to the ornithologist; and in flying towards their nests, when the wind is against them, and when loaded with heavy prey, these birds may be seen to tack about and to shift their course with great dexterity so as to attain their haven with the least possible exertion. The osprey occurs in both the Old and the New World. It is found in Europe and North America, and species belong to the East Indies and Australia also. The general body-colour is a rich brown, the tail being banded with alternate strips of light and dark hues. The head and neck are whitish on their upper portions, and a brown stripe extends from the bill down each side of the neck. The under parts of the body are coloured white, the legs being of a bluish tint. In length the osprey averages about 2 feet, the wings measuring over 4 feet from tip to tip. The nest is usually found near the aquatic haunts of the bird, and is generally built in a tree of considerable height, although, according to Audubon, it may be situated on the ground. The female lays three or four eggs, and the male guards the nest and feeds the female during the incubatory period. The toes are armed with strong curved nails, and are covered on their upper aspect with large scales or 'scutella.' The lateral scales of the toes, and also those covering the pads or protuberances beneath the toes, are provided with small spinous processes, which are of service in enabling the feet to retain hold of the slippery prey. The outer of the three front toes can be turned in some degree backwards, and through this arrangement objects can be more readily grasped by the feet. The American Bald Eagle (*Haliaëtus leucocephalus*) is a natural plunderer of the osprey, and watches the latter bird when engaged in its fishing operations. The eagle pursues the successful fisher, who drops his prey with the view of escaping from his pursuer, when the eagle immediately pounces after the descending fish, and seizes it ere it touches the water.

OSSIAN, POEMS OF, the subject of a great literary controversy of the eighteenth century, which can hardly be said to be terminated. The origin of the controversy was the publication by James Mac Pherson of two epics, Fingal and Temora, together with some minor poems, professedly translated from the Gaelic, and attributed to the Gaelic bard Ossian. (See MAC PHERSON—JAMES.) A brief recapitulation of the facts surrounding this publication is necessary to give clearness to an account of the controversy.

James Mac Pherson (born 1738) had early given indications of considerable literary ambition, by the publication of various poetical works of no great merit, particularly a long poem in six cantos called

the Highlander. He had been schoolmaster at Morven, Inverness-shire, and was private tutor in the family of Thomas Graham, afterwards Lord Lynedoch, when he was induced by Home, the author of the tragedy of Douglas, and other literary men of reputation, to publish some alleged translations of Highland poetry. This publication appeared in 1760, under the title of Fragments of Ancient Poetry collected in the Highlands of Scotland, and translated from the Gaelic or Erse language. It became immediately popular, and an anonymous preface written by Dr. Blair having given indications of the existence of other works of the same kind, particularly a heroic poem relating to the expulsion of the Danes by Fingal, a subscription, in which many eminent literary men took part, was raised to enable Mac Pherson to travel in the Highlands, for the purpose of collecting further remains of the national literature. After a tour in the Highlands and consultation with some Gaelic scholars, Mac Pherson produced in 1762 Fingal, an epic poem in six books, together with several other poems by Ossian, the son of Fingal. Temora, an epic in eight books, with other minor poems, appeared in 1763. The time of Fingal was changed to the third century, and the struggle of the hero took place with the Romans instead of with the Danes. In his preface Mac Pherson alleged that his version was a literal translation of works which had been transmitted orally from bard to bard until the introduction of writing permitted them to be committed to manuscript. Immediately on the publication of Fingal it attained an immense popularity; it was translated within a year into all the principal languages of Europe. It numbered among its admirers the ripest scholars and the most distinguished men of genius of the age; and not only men of genius in the full maturity of their fame, but men who subsequently rose to the highest eminence confessed its fascination and its power over their early impressions. The Italian translation was the work of Cæsarotti, a scholar and writer of recognized genius, whose version, an evident labour of love, served not only to extend the fame of Ossian, but to raise his own reputation. Among its admirers was the Emperor Napoleon, who preferred it to all the works of antiquity, and, in imitation of Alexander the Great with Homer, had a special coffer for it in which he carried it about with him. In France an Ossianic school of poetry was formed, and among modern poets Lamartine may be cited as one who confessedly drew his inspiration from this source. In Germany there were numerous translations, and among the admirers of Ossian may be numbered Klopstock and Goethe. At home Sir Walter Scott and Wilson confessed its charms.

But while the immediate success was amply sufficient, as Mac Pherson said, 'to flatter the vanity of one fond of fame,' and while the popularity of his works was sufficiently enduring to yield handsome pecuniary results, the blast of the angry controversy which outlived their fame, and which made the position of their author far from enviable, had, even before the appearance of Temora, begun to blow. The question of authenticity which was raised immediately on the publication of Fingal was noticed with somewhat lofty disdain by Mac Pherson in his preface to Temora, and although he then professed to be able to meet it by the production of the originals, he generally maintained throughout the controversy an angry silence. The rage of this controversy when it reached its height, and the extent of the excitement produced by it, were commensurate with the fame of the poems, and for long the battle waged with doubtful advantage. At first the authority of Dr. Blair, who wrote an elaborate critical dissertation in favour of the authenticity of the poems, was regarded as of paramount authority throughout Europe; and notwithstanding the emphatic denunciation of Dr. Johnson, who went so far as to assert that in the whole Erse language there could not be discovered 500 lines which could be proved to be a hundred years old, the doubts of Gibbon and Hume, and the objections of other critics, the believers in the genuineness of Ossian continued to hold their ground until Malcolm Laing entered the lists as the champion of scepticism. His unsparing criticism, first in the introduction to his History of Scotland (1800), and afterwards in an annotated edition of the poems themselves (1805), seems to have given the death-blow to the position of those who maintained the integrity of the Ossianic epics. But between the rude scepticism of Dr. Johnson and the unhesitating faith of Dr. Blair there were innumerable shades of middle opinion, the advocates of which, according to the degree of their credulity or incredulity, ranked themselves on one or other side of the controversy; and it is not yet determined, and probably never will be, where the exact truth in regard to these middle opinions lies.

One strong point with the defenders of the genuineness of the Ossianic poetry, was the proved incapacity of Mac Pherson from his known productions to forge them. He was even described by his friends as a bungling translator. The entire neglect into which the Mac Pherson epics have fallen has now deprived this argument of much of its weight; but the taste of the present day cannot be held as conclusive against the overwhelming evidence already adduced, of real power felt and acknowledged by the most competent judges. The very faults charged against Ossian have from another point of view been regarded as its highest beauties. The abrupt transitions, the vaguely suggestive rather than minutely accurate descriptions, the perpetual recurrence of the same sentiments and images, have all been regarded as highly characteristic of the poetry of an unsophisticated people. On the other hand, the two strong points of the opponents of Mac Pherson were the objection of Hume, that the preservation for many ages through oral tradition of poems of such extent was wholly incredible, and that the poems themselves contained no internal evidence of the period to which they belonged. In the words of a modern critic (Mr. W. M. Hennessy) 'the reader of the Gaelic Ossian seeks in vain through page after page filled with a weary reiteration of monotonous imagery, and ever-recurring platitudes about fogs and mists, and locks flowing in the wind, for any mention of what the warriors ate or drank, how they were dressed, where they slept, or how they spent the intervals of repose between one battle and another.'

In 1797, while the controversy was still unabated, the Highland Society issued a committee to inquire into the authenticity of the poems. Its report issued in 1805, signed by Henry MacKenzie as chairman, contains some suggestive statements. While they assert that poetry distinctly known as Ossianic was common in the Highlands, and that they had procured fragments nearly identical with passages in Mac Pherson, they add that 'the committee has not been able to obtain any one poem the same in title and tenor with the poems published by him. It is inclined to believe that he was in use to supply chasms, and to give connection by inserting passages which he did not find, and to add what he conceived to be dignity and delicacy to the original, by striking out passages, by softening incidents, by refining the language, &c.' They add that it is impossible for the committee to determine to what degree he exercised these liberties. Their materials were evidently small,

and their opinion conjectural; but it probably indicates the *modus operandi* of Mac Pherson, and it seems also probable that to his skilful manipulation the popularity of what was really Ossianic in his poems was in great measure due.

The committee only gleaned after Mac Pherson; but in 1807, after the death of Mac Pherson, and in accordance with his will, appeared the Gaelic originals of his poems, with a Latin translation, and accompanied by a new dissertation on their authenticity by Sir John Sinclair. Hence arose a new and singular controversy. It was asserted that these originals, the MSS. of which were all in the handwriting of Mac Pherson, were translated by himself from the English, while others who did not consider his knowledge of Gaelic sufficient for the purpose charged him with procuring assistance to translate them. The former charge seems to be about as well substantiated as the original fabrication; the latter seems somewhat hard to believe.

What appears really to have been decided as to the merits of the controversy, is that Ossian was a real or mythical Irish bard of the second or third century, of whom there are probably no authentic remains, although some brief poems, which cannot be traced further back than the eleventh century, are attributed to him. There are numerous traditions regarding him both in Scotland and Ireland. In the earlier Irish traditions he does not even appear to have been the chief bard of his period. The Scotch traditions are much more mixed, and the transference of the scene of the events sung by Ossian to Morven (Argyleshire) was probably not the work of Mac Pherson. Even his hesitation as to the period of these achievements seems most likely to have been due to the conflicting authority of his documents. Many considerations, which we have not had space to adduce, tend to show that Mac Pherson must have had considerable materials to work upon. But the continuity, the epic form, and much of the material of his poems must undoubtedly have been supplied by his own invention. There are even some indications that he intended, had he not been provoked by the exasperating charges made against his honour, at some future time to have acknowledged them. This is the opinion of Sir James Mac Intosh.

In very recent times the controversy has been revived. The Original Gaelic of the poems, with a literal translation into English, and a dissertation on their authenticity, by the Rev. Archibald Clerk, together with the English translation by Mac Pherson, was published in 1870, and is ably reviewed in the Academy for August, 1871, by W. M. Hennessy, whom we have quoted above. This rechauffée of the contest seems to present no particular novelty.

OSSIFICATION, the process of bone-formation, which in all cases essentially consists of the deposition of earthy or calcareous matter. It may exhibit two modes of occurrence. Bone may be formed by the deposition of earthy or osseous material in fibrous membranes, that is, in tissues composed of fibres and cell elements. The flat bones of the skull or cranium are developed in this first manner. No granular or intermediate stage is observable in this process, the earthy matter being simply deposited in spaces which result from absorption. In the second modification of the process of ossification, exemplified in the formation of the long bones of the skeleton, the osseous material is deposited in a primary basis of gristly or cartilaginous kind. Ossification in this latter instance is therefore said to begin in *cartilage*, just as in the previous case it began in *membrane*. The process of ossification in cartilage exhibits activity at several distinct and marked points of its extent. These points are the active centres of bone-growth, and are hence called *centres of ossification*. The limy material is therefore diffused from these centres throughout the extent of cartilage, the blood-vessels of the adjoining parts bringing supplies of material from which the earthy matters are deposited within the cartilaginous basis. The corpuscles of the cartilage are seen to be arranged in vertical rows, and the calcareous matter, deposited in the form of granules, is thrown in around them. The nuclei of the cartilage cells are left unossified, a space also being kept free around each nucleus, which becomes one of the *lacunæ* or minute cavities seen in a microscopic section of bone-tissue. The first deposits of bony matter are of an irregular and thick description, this form of ossification, if persisted in, producing *cancellated* bony tissue; whilst by a subsequent process of absorption of the spaces in the cancellated tissue, and by the further deposition of bony matter, the irregular tissue is converted into *compact* bone. The gradual growth of bone takes place by a continual development of the cartilaginous basis between the various centres of ossification, and in this new basis earthy matter is as continually being formed. See also BONE.

Ossification may also occur abnormally in living textures, and as the result of diseased conditions. Deposits of limy matter thus take place within the coats of blood-vessels, rendering them friable and readily ruptured. The valves of the heart may become calcareous, and calcareous degeneration may even affect tumours and other products in themselves of abnormal nature. A distinction ought certainly to be made between mere *calcification* as just indicated, and true *ossification*, or the formation of *bone*. But in either case the deposition of limy matter forms the basis or essential feature of such cases. The gall-bladder may thus be converted into a hard limy sac or bag, and even the pericardium or investing sac of the heart may occasionally exhibit a high degree of calcification.

OSSOLI, MARGARET SARAH FULLER, an American literary lady, born in 1810, remarkable for her precocity and her association with Emerson and other eminent literary men rather than for her own productions. She was taught at the age of six to read Latin, and early made herself acquainted with English and continental literature. In 1840 she became editress of the Dial, which numbered Emerson and other distinguished writers among its contributors. In 1844 she removed to New York, and became one of the writers for the Tribune. She visited Europe in 1846, married in 1847 the Marchese Ossoli; was in Rome during the siege of 1849, when she acted as superintendent of an hospital for the wounded, and embarked with her husband for New York, but perished almost in sight of port off Long Island, July 16, 1850. She translated Eckermann's Conversations with Goethe, and wrote Summer on the Lakes (1843), Women in the Nineteenth Century (1845), and other works, which are said to exhibit culture and ability, together with a high moral aim, but are likewise charged with 'a cloudy and rhetorical style,' and other indications both in thought and language of a forced education, and on the whole do not seem likely to achieve more than a temporary popularity.

OSSUNA, DON PEDRO TELLEZY GIRON, DUKE OF, celebrated for his government of Naples and Sicily, was born at Valladolid in 1579. His grandfather, Viceroy of Naples, took him when two years old to Italy. In 1588 he returned to Spain, and was educated at Salamanca. His satirical wit made him many enemies at the court of Philip II., and he was banished from the capital on account of a disrespectful answer to the king. After the death of Philip he returned, attached himself to the Duke of Lerma, the favourite minister of Philip III., and took the

title of Duke of Ossuna. The courtiers, however, again found means to procure his banishment, and he served several campaigns in Flanders. In this interval he visited France and England, and was received with many marks of favour by Henry IV. and James I., the former of whom was delighted by his wit, and the latter with his learned conversation in Latin. In 1607 the Duke of Lerma procured permission for him to return, and Ossuna exercised his influence in effecting the acknowledgment of the independence of the United Netherlands by the Treaty of 1609. His opposition to the expulsion of the Moors from Spain exposed him to the persecutions of the Inquisition, which, however, was unable to fix any charge upon him. The viceroyalty of Sicily was soon after conferred on him, and he remained there till 1615. The restoration of public security, the repression of the violence of the nobles, the encouragement of commerce and agriculture, and the deliverance of the coasts from the ravages of the Turks, prove the vigour and wisdom of his administration. In 1616 he was appointed Viceroy of Naples. He resisted with success the claims of Venice to the exclusive navigation of the Adriatic. Philip, at the instigation of the Papal nuncio, having formed the design of introducing the Inquisition into Naples, Ossuna refused to obey his orders to this effect, and his enemies were busy in their efforts to bring him into disgrace with the court. To avoid the storm which now threatened him, he married his daughter to the son of Lerma. His opposition to the establishment of the Inquisition had, however, excited the animosity of the clergy, who were very powerful in Naples; and as he foresaw that the intrigues of the court would sooner or later strip him of his power, he formed the bold plan of raising himself to the sovereignty of the country. In prosecution of this design he sounded the dispositions of Savoy, Venice, and France in 1617, and formed connections with Holland and the Porte. (See Daru's Histoire de Venise.) A part of his plan became known, a capuchin denounced the viceroy in Madrid, and he was recalled in 1619, but returned in a sort of triumph. On the accession of Philip IV., however, he was arrested, and proceedings were commenced against him. They continued three years, but nothing was proved against him; and he died in confinement in the castle of Almeida in 1624.

OSTADE, Adrian van, a painter of the Flemish school, was born at Lübeck in 1610, and studied under Francis Hals. His pictures are characterized by an exact imitation of nature, and contain admirable representations of subjects which in other hands would have been mean or commonplace. They usually consist of the interiors of alehouses or kitchens, with Dutch peasants smoking, quarrelling, or drinking, but he throws such expression into the heads of his characters that their vulgarity is lost in our admiration of their truth and animation. His colouring is rich and clear, his touch spirited and free, and all his works are highly finished. On the approach of the French troops in 1662 to Haarlem Ostade sold all his pictures and effects in order to return to Lübeck, but at Amsterdam he was prevailed upon to remain, and he practised his profession with great reputation until his death in 1685.

Isaac van Ostade, his brother and scholar, was born at Lübeck about 1612. His earliest pictures, which he painted in imitation of his brother, were greatly inferior, but he afterwards adopted a style of his own, in which he was successful; and he was often solicited by contemporary landscape-painters to add his figures to their pieces. The time of his death is uncertain, but is believed to have been about 1671.

OSTASHKOV, a town of Russia, in the government and 110 miles from the town of Tver, on a small tongue of land projecting into Lake Seligher. It has courts of justice, four churches, a nunnery, a gymnasium, three hospitals, and a large bazaar, where all the shopkeepers of the town have their shops, all of brick, the houses generally being of wood. There are numerous malt-kilns, tanneries, and tallow-melting establishments, and a great many barges are built for the navigation of the Volga. The trade is considerable. Pop. 12,025.

OSTEND, a seaport town of Belgium, in the province of West Flanders, on the North Sea, 67 miles north-west of Brussels. It is strongly and regularly fortified, being one of the line of fortresses intended to defend the Belgian frontier on the side of France. Its situation, on a low sandy coast where no trees will grow, is by no means agreeable, though it is said to have a pure healthy air, and is much resorted to for sea-bathing. It is entered by four gates, and is on the whole well built. The public buildings, none of which deserve particular notice, are the Hôtel de Ville, three churches (one Protestant), a prison, a civil and a military hospital, barracks, and an arsenal. The harbour is not easy of access; but the basin within is extensive, and forms the termination of a magnificent line of canals stretching like net-work into the interior, and furnishing admirable facilities for commerce. The manufactures of Ostend are unimportant. Cod and herring fishing are carried on to a considerable extent, and an important branch of trade is oysters, brought from the English coast, fattened here in large salt reservoirs, and transported as far as Paris under the name of *huîtres d'Ostende*. Ostend was founded in the ninth century, walled in 1445, and regularly fortified in 1585 by the Prince of Orange. In the great struggle in which the States-general threw off the yoke of Spain, it sustained a memorable siege from 4th July, 1601, to 28th September, 1604, during which the besieged lost about 50,000 men, and the Spanish besiegers more than 80,000 men. Ultimately, when reduced to a mere heap of ruins, it obtained an honourable capitulation. It was ceded to the empire in 1715, and restored to the Dutch in 1748. By railway Ostend is connected with all parts of Belgium, with France, and Prussia; and steamers ply regularly between it and London and Dover. Pop. 19,696.

OSTEOLOGY, the department of anatomical science specially devoted to a description of the bony parts or skeleton of the body, and included under the wider science of anatomy (which see, as also Skeleton, Bone, &c.)

OSTERODE, a town of Prussia, in Hanover, 33 miles S.S.E. of Hildesheim, on the Soze, at the foot of the Harz Mountains. It is walled, has three churches, a gymnasium, infirmary, and extensive corn magazines; manufactures of woollen and linen goods, calicoes, drills, white-lead, shot, soap, needles, and articles in wood; tobacco factories, tanneries, machine-works, oil, walk, gypsum, and other mills. Pop. 6087.

OSTIA, an ancient city, formerly the port of Rome, at the mouth of the Tiber, 6 miles from Rome by the Via Ostiensis. It was founded, according to the unanimous accounts of Roman writers, by Ancus Martius, who also established salt-works at its site, which long continued to supply Rome and the neighbourhood. Ostia also supplied Rome with corn from Sicily and Sardinia, and it must have grown with the prosperity of the metropolis. It was not, however, till the wars with Carthage rendered it of importance as a naval station that it appears in history. During the second Punic war it became the station of the fleet destined for the protection of Rome and the Italian coasts. On account of its

commercial importance to the metropolis, it enjoyed special privileges. In B.C. 207 the right of exemption from military service was conferred upon it and Antium alone of the maritime colonies of Rome. These cities were only obliged to garrison their own walls. An attempt was afterwards made to extend the exemption to naval service, but this was peremptorily refused.

The decline of Ostia appears to have been due to its unfortunate position as a port from the constant filling up of the river, from which its site is now 2 or 3 miles distant. Even in the time of Strabo the alluvial deposits brought down by the Tiber had so filled up the port that the larger vessels were compelled to ride at anchor in the open roadstead. Claudius constructed a new harbour with great labour about 2 miles north of Ostia, which communicated with it by a canal. It was situated on the right mouth of the Tiber, called Fiumicino, which is probably an artificial one, as there appears to be no mention of it before the time of the empire. It was called the Portus Augusti, and afterwards, when enlarged by Trajan, the Portus Trajani. Between the two mouths of the Tiber was formed an island called the Insula Sacra. The new port became the seat of a town called Portus Ostiensis or simply Portus. It communicated directly with Rome, and soon began to encroach on the trade of Ostia, which, however, continued to flourish for some centuries after the commencement of the Christian era, and was not extinct at the fall of the empire. The destruction of Ostia was completed by the Saracens in the ninth century. Its ruins are about half a mile below the modern village, founded by Gregory IV. in 830, and strongly fortified, which is now a place almost without inhabitants. The ruins of Portus are on the right bank of the Fiumicino, about 2 miles from the coast.

OSTIAKS, a Finnish race who dwell chiefly in the Siberian governments of Tobolsk and Tomsk, on the banks of the Tom, Tchulim, and Ket, and also in the districts at the mouth of the Yenisei, Obe, and Irtish, near Surgut, Tobolsk, and Berezov. Those of the government of Tobolsk are said to be the purest. They consist of three tribes, well distinguished from each other by customs and language. Their language, of which the dialects are numerous, is classed by Max Müller as a branch of the Samoiedic, a language of Turanian stock. At present their aggregate amount may be estimated at some 100,000 souls. Of uncertain origin, though possibly Mongolian stock, are the Siberian Yenisei Ostiaks, on the Yenisei, between the Upper and Lower Tunguska. They speak an entirely different language from all the other Ostiaks, and for a long period have completely adopted Mongolian customs. A grammar of the Ostiak language was published by Castren at St. Petersburg in 1849.

OSTIGLIA, a town of Italy, Venetia, in the province and 18 miles E.S.E. of Mantua. It is ancient and well built, has several churches and suppressed convents, a theatre and hospital; manufactures of straw, reed, and wicker work, and a trade in wood, corn, wine, oil, provisions, and silk. Pop. 6829.

OSTRACION, the scientific name of the Trunk or Coffer Fishes (see TRUNK-FISH), included in the division Plectognathi, which forms a sub-order of the Teleostei or Bony Fishes. In these forms the maxillary and premaxillary bones of each side of the head are firmly ossified together. The body is shortened. The fins are small and of soft nature, the ventrals being wanting. The inner skeleton is only partly ossified, but the outer skeleton is of very strong and perfect description, and constitutes a very marked feature in these and allied fishes. The body is thus inclosed in a literal armour-casing of strong bony plates or scales of the *ganoid* variety, which are immovably united, and invest every part of the body, save the tail, which is movable, but is itself inclosed in a bony casing. The gill-covers are invested with these plates so as to reduce the gill-opening to a small size. The vertebræ are also ossified together in an immovable manner. The dorsal fin is small, and possesses soft rays only. The jaws possess each from ten to twelve teeth of conical shape. These fishes do not attain a large size, and are common in tropical seas, being found off the coast of America. The *Ostracion cornutus* is a familiar species.

OSTRACISM (Greek, *ostrakon*, shell), a popular judgment by which, according to the Athenian law, a citizen was consigned to banishment. It was not a punishment for any offence actually committed, but a precaution against the projects of personal ambition and the excessive growth of individual power and influence. When it was decided by the popular assembly and senate that a citizen should be banished, no name being mentioned in the preliminary discussion, the voting took place in the following manner:—A place in the *agora* was inclosed by barriers, with ten gates for the ten tribes. By these the voters entered and deposited their votes, written on a shell or piece of tile. The archons counted the votes, and the person against whom the majority was given, provided it amounted to more than 6000 votes, was obliged to leave the city within ten days. The place and period of banishment were fixed. The latter usually extended to ten years. Ostracism did not include forfeiture of property. Among the distinguished persons ostracized were Themistocles, Aristides, and Cimon, son of Miltiades, who were afterwards recalled.

OSTRICH (*Struthio camelus*), a typical example of the order of Cursores or Running-birds. It is the largest of existing birds, and attains an average height of from 6 to 8 feet. It inhabits the sandy plains of Arabia and Africa, and is hunted chiefly for the sake of the feathers, which have a high commercial value as articles of dress and decoration. The ostrich, as the type of the family Struthionidæ, possesses a head and neck comparatively destitute of feathers. The general body-plumage is black in colour; the feathers of the wings and tail being white, marked occasionally by black; the wings are 'spurred;' the thighs are naked, and the tarsi or 'legs' are covered by scales; the bill is of broad conformation and of triangular depressed shape; the apex is blunted, the nostrils being situated in a groove or depression; the inner or third toe (*hallux*) is wanting, the outer of the two toes being the smaller and clawless; the plumage is loosely attached, and the barbs of the feathers or 'plumes,' constituted in chief by the 'quill-feathers' of the wings and tail, although provided with little barbules, are not united to form a continuous 'vane' or 'web,' as in the feathers of most birds. This want of union between the barbs of the plumes gives to the ostrich-feathers their well-known graceful appearance. The wings are of small size, and are incapable of being used as organs of flight, but the bird appears to use them after the fashion of aerial paddles in running. The bones of the pelvis are united inferiorly—that is, at the pubis—in the ostrich, a conformation occurring in no other bird. The breast-bone is destitute of the great ridge or keel seen in other birds, and which forms the point of attachment for the wing-muscles; and although some of the bones are 'pneumatic' or possess air-cavities, yet others are filled with marrow in accordance with the terrestrial habits of these birds. These birds are gregarious in their habits. The chief dietary is grass, grain, &c., and substances of a vegetable

nature; the food in this respect resembling that of the Rasorial or Gallinaceous birds. The ostrich has been long celebrated for its propensity for swallowing curious and heterogeneous substances, such as pieces of iron and glass, large stones, and other objects of like anomalous description. These substances are probably swallowed to aid the gizzard in its work of triturating or bruising the food, after the same fashion and for the same reason that pebbles are swallowed by our domestic fowls and other birds. In their reproductive habits ostriches are polygamous, each male taking several females under his protection. From ten to twelve eggs are laid, and are deposited in the sand, each egg weighing about 3 lbs. The nest is a mere hole scratched in the sand, the same excavation receiving the eggs of several females. The heat of the sun partly aids the work of incubation, which work by some authors is alleged to be undertaken alternately by the males and females, and by others to be performed exclusively by the male birds. The night appears to be the chief time when incubation is performed, and the nest appears to be jealously guarded from intrusion, any attempt to touch the eggs generally resulting in the desertion of the nest and in the destruction of the eggs. These birds may be tamed and domesticated, and they breed in confinement. The ostrich is then of a gentle disposition towards those who are accustomed to feed it, but even in captivity will attack strangers. The ostrich outstrips the speed of the fastest horse, the mode of capturing these birds being to continue the pursuit on fresh steeds until the bird becomes worn out. The birds, when bewildered, appear to run in a circle, when they are more easily pursued, as indicated above. When brought to bay they may attack their pursuers by striking with their feet. A mode of pursuit has also been described in which the hunter disguises himself with an ostrich skin, and can in this disguise approach near enough to shoot or secure the birds. The ostrich has been celebrated from classical times and from the earliest ages. It is alluded to in the Old Testament, its flesh being an article of food forbidden to the Jews. Its feathers were much used of old, as in the present day; and we find that in some instances its flesh was accounted savoury enough to cause it to be held in esteem. Heliogabalus thus caused the brains of 600 ostriches to be served up at one meal. (Pl. CXLVIII.–CXLIX. figs. 7, 8, 9.)

The term 'American Ostrich' has been applied to the Rheas of the New World (*Rhea Americana*), which are, however, distinct from the true Ostriches. These birds are of smaller size than the Ostriches. The head is feathered; the feet possess each three toes provided with claws; the wings are of feeble or rudimentary nature; the body-colour is a uniform gray, unrelieved by lighter or darker patches; and the plumage resembles that of the ostrich in its conformation, but is of little or no commercial value, being chiefly used in the manufacture of light brushes for dusting pictures. The chief habitat of the Rhea is the plains of tropical America. It is captured by means of the 'lasso,' or by entangling its legs in a cord weighted by heavy balls or stones, and which is thrown after the bird when running. These birds swim slowly but easily. Like the Ostriches they are polygamous, the male taking the greater part of the incubatory duties upon himself, and also preparing the nest for the reception of the eggs. The Rhea is of gentle disposition, but may be roused to fierceness and anger, especially when sitting upon the eggs.

The feathers of the back of the ostrich are those most valued, those of the wings and tail ranking next in order of commercial worth. The cast or dropped feathers are less valuable than those taken from the living or recently killed bird. Ostrich feathers are dyed black for the purpose of forming undertakers' plumes by a solution of logwood, copperas, and acetate of iron. A full set of plumes of this description costs from £200 to £300. For ordinary purposes the feathers are first scoured or washed with soap and then bleached and dried. The finest are the white feathers, which fetch from seven to eight guineas per pound. Aleppo in Syria forms the chief mart of export for the white feathers, but from Alexandria, Cairo, Tunis, Algiers, and Madagascar large quantities are also exported. Those of Senegal and Madagascar are generally of inferior kind. Leghorn forms a great depot for the reception of ostrich feathers from the before-mentioned sources of supply, and Paris receives nearly three-fourths of the total supply from Leghorn, England receiving the remaining fourth. London imports large quantities directly from the Cape of Good Hope.

OSTROG, a town in Russia, government of Volhynia, at the junction of the Vallia with the Gorin, 103 miles west of Jitomir. It is defended by an old castle, and has several Greek and Roman Catholic churches, a convent, seminary, riding-school; and a considerable trade. It is the seat of an archbishop, and the place where the Bible was first printed in Slavonic. Pop. 7707.

OSTROGOTHS. See GOTHS.

OSUNA, a town, Spain, Andalusia, province and 41 miles east of Seville. It consists of spacious well-paved streets, and has a magnificent church, once so rich, that the French, during the Peninsular war, are said to have robbed it of 5 cwts. of ancient plate; a large and splendid college, and several hospitals. The chief manufactures are iron, linen, soap, earthenware, and articles in esparto; oil-mills are also numerous, and large quantities of grain are sent to Seville and Malaga. Pop. 17,211.

OSWEGO, a city and port of the United States, in Oswego county, New York, on the Oswego, which here falls into Lake Ontario. It rises finely from both banks of the river, and is regularly and handsomely built, consisting of a number of public squares and streets, 100 feet wide, intersecting each other at right angles. Among the churches, the first Presbyterian and the Episcopal deserve special notice, both for the beauty of their site and the elegance of their structure; there is a court-house and a custom-house. The manufacturing establishments include iron-foundries, machine-shops, ship-yards, tanneries, and saw and flour mills, for which ample water-power is supplied by the Oswego; and the trade, chiefly transit, both on the lake and in the interior, by canal and railway, is of vast extent, Oswego being an emporium for the traffic to New York from Canada and the west. Pop. in 1880, 21,116.

OSWESTRY, a market-town and municipal borough of England, in the county of Salop, 18 miles north-west of Shrewsbury, on the Cambrian Railway. It consists of some very old, and a greater number of substantial modern brick houses. It is of great antiquity, deriving its name from Oswald, king of Northumbria, and makes some figure in early English history. It has two parish churches, one of them a very old edifice; several Dissenting chapels, a grammar-school, a public-hall and literary institute, National school, the Victoria rooms for concerts, theatre, &c., and two commodious market-houses, one of them for corn and cheese, and the other for butter and butcher-meat. There are railway workshops here, and a trade in agricultural produce and malt. Oswestry gives the title of baron to the Duke of Norfolk. Pop. in 1871, 7308; in 1881, 7847.

OSYMANDYAS, an ancient king of Egypt, mentioned by Diodorus Siculus, who assigns his reign to the period between Menes and Mœris, reports that

he invaded Asia with a vast army, and penetrated as far as Bactria, and that on his return he erected at Thebes, besides other great works, a monument to himself of unparalleled magnificence, with a sitting colossal statue of enormous size. There appears to be equal difficulty in identifying him with any known monarch of Egypt, and his works with any known remains. The Memnonium at Thebes has been represented as his monument.

OTAGO, a provincial district of New Zealand, comprising the southern portion of South Island. It is bounded on three sides by the ocean, and has a coast-line of 400 miles, indented on the west side with numerous deep inlets, and having on the east and south the harbours of Otago, the Bluff, and Invercargill, besides others. Its area is 23,500 square miles. The capital, Dunedin, stands at the head of Otago harbour, but large vessels do not ascend above Port-Chalmers, which is about 9 miles distant. The whole of the western and central portion of the province is mountainous; Mounts Aspiring and Earnslaw in the north-west exceed 9000 feet in height, and those between 3000 and 9000 feet are very numerous. The eastern portion is comparatively level, and here and also in the south there are extensive and fertile plains and valleys well adapted for agriculture. The chief agricultural operations are confined to the Taieri Valley, near Dunedin, the Tokomairiro Valley, and the lower valley of the Molyneux or Clutha. There are extensive uplands in the province well suited for sheep-rearing, especially in the Oamaru district in the north-east. The principal crop grown in the province is wheat, after which oats is the most important. The largest river in the province, and in New Zealand, is the Clutha or Clyde, called Molyneux by Captain Cook, which enters the sea near the south-east corner of the province. It carries off the waters of Lakes Hawea and Wanaka in the extreme north of the province, and of Lake Wakatipu in the north-west, and is estimated to discharge sixteen times as much water as the Thames, and more than the Nile, being a very rapidly running river. It is navigable for most of its course. Besides the lakes already mentioned, of which Wakatipu has an area of 114 square miles, there are in the south-west Lakes Te Anau and Manipori, covering together an area of 182 square miles. The Waiau, draining Lakes Te Anau and Manipori, the Oreti, and the Mataura flow nearly due south, and fall into Foveaux Strait. Timber is abundant in the district; and New Zealand flax (*Phormium tenax*) grows wild. Rich gold deposits have been found; the gold fields cover an area of 2½ million acres, and have yielded for export much more than any other province. Coal has been found in great abundance. It is chiefly of the tertiary formation, but it is of great value for local purposes, and has greatly aided the development of the colony. The Otago provincial council has voted several considerable bounties for the establishment of trades. The climate somewhat resembles that of Scotland, but is milder. Otago was founded by the Scotch Free Church Association in 1848, and was first occupied chiefly by Scotch emigrants belonging to the Free Church, but settlers of all denominations have now found their way there. It is well supplied with churches and schools, and has a university. Pop. in 1874, 85,082; in 1881, 134,077.

OTAHEITE. See TAHITI.

OTALGIA, the name given by Itard to a nervous affection of the cord of the tympanum, or of the acoustic nerve. Other authorities say that the acoustic nerve is not the seat of this affection. It is the common earache, and is distinguished from *otitis* (inflammation of the ear) by its sudden attack. The pain does not come on gradually, but instantaneously attains its maximum intensity. It is often associated with other ailments, of which it may be only a local symptom. Thus it often proceeds from toothache, and even when that affection is not directly felt it may be caused by a decayed tooth. Neuralgic pains in other parts of the face frequently follow it. It is sometimes also associated with rheumatism, and in one case, mentioned by Copland, it alternated with sciatica. Foreign substances, such as insects in the *meatus auditorius*, will also occasion it. The disease is, however, properly nervous, and to this form of the disease the description of its sudden attack especially applies. When the pain is very intense it extends to the temple and nerves on the same side of the face in which it causes painful irradiations. It frequently departs suddenly and returns again generally to the same ear. The treatment when the disease is symptomatic must depend upon the cause. The carious tooth, if it is associated with one, should be extracted. The foreign substance in the ear must be removed if possible. This may sometimes be done by injection, at others it may be better to wait its discharge by the increased secretion which it occasions. For non-symptomatic otalgia Itard recommends to sponge the head with water for a quarter of an hour, then to rub it with flannels till it is perfectly dry, and cover it with a dry flannel. When the hair is too long for this treatment a cataplasm composed of verbena roots boiled in milk, and formed into a poultice with linseed-meal, may be applied to the cheek and temple between two folds of cloth. He also recommends 3 drachms of Hoffman's anodyne, mixed with ½ oz. of water, to be placed in a vial immersed in a vessel containing hot water, and the mouth of the vial applied to the ear, so that the vapour may be directed into the passage. Opium is not to be recommended. An application of black soap, or a blister, behind the ear or on the temple may be attended with good effect. Aperients and emetics have been found serviceable, and besides the topical treatment the affection may be treated as neuralgic.

OTARIA, the genus or group of 'Eared' Seals, so named from their being the only seals in which external ears are developed. The ears are, however, not of large size. These forms possess elongated necks, and have the power of raising themselves and of walking upon both fore and hind limbs. They evince, especially in their skeleton, a near approach to the Bears. The 'eared' seals are found in the southern seas exclusively. The most familiar species are the *Otaria jubata*, or 'sea lion,' and the *O. ursina*, or 'sea bear.' The latter furnishes a 'fur-seal' of a yellowish colour. This form was formerly common in the neighbourhood of the Falkland Islands. See also SEAL.

OTFRID, or OTFRIED, the author of one of the earliest specimens of composition in the German language. He was by birth probably a Franconian, and lived in the middle of the ninth century. After having become a monk of the Abbey of Weissenburg, in Alsace, he studied under Rabanus Maurus, abbot of Fulda. He then returned to his monastery, where he opened a school of literature, and wrote a variety of works in prose and verse. The most important of these is a rhymed version or paraphrase of the Gospels, in old High German, still extant, in which there are some passages of lyrical poetry. He completed it about 868, and dedicated it to Ludwig, king of Germany. An edition of it was published by Kelle in 1856, and a German translation by Rapp in 1858.

OTHMAN. See CALIPH.

OTHO I., surnamed the *Great*, Emperor of Germany, son of Henry I., was born in 912. Although a younger son, he was early appointed to fill the

throne by his father, at whose death he was, notwithstanding the efforts of a strong rival party, headed by his own mother in favour of her second son, formally crowned King of Germany, at Aix-la-Chapelle, in 936. His reign of thirty-six years was an almost uninterrupted succession of wars, which arose partly from the seething elements of feudalism, the aversion of the German tribes to each other, and the hostile attitude of the surrounding nations. He was scarcely seated on his throne when he found himself compelled to undertake a war against Boleslas, duke of Bohemia, whom, after a fourteen years' struggle, he reduced to subjection, and compelled to accept Christianity. Otho also brought to a successful issue the struggles with the Dukes of Bavaria and Franconia, and invested his son Ludolf (949) with the Duchy of Suabia, and his brother Henry with that of Bavaria. Conrad, count of Worms, married Otho's daughter, and received Lorraine. Otho likewise gained reputation in his dealings with foreign states. The Danes, who had invaded Germany, were driven back beyond the Eider, the Danish king was obliged to embrace Christianity, and acknowledge himself a vassal of the empire. Louis (Outremer) called in his aid against the great vassals under the powerful Hugh the Great. Otho reduced the rebels to terms, and confirmed the authority of the king. The Italians next required his assistance to deliver them from the oppressions of Berengar II. Otho defeated the usurper, married the widow of the last king, and was crowned King of Lombardy at Pavia, in 951. This marriage not only engaged him in ambitious attempts for the possession of Italy, but attracted many foreigners to his court, and involved him in family dissensions. His son Ludolf, and his son-in-law Conrad, duke of Lorraine, revolted, but were worsted, and deprived of their duchies in 954, which were placed under Bruno, archbishop of Cologne, brother of Otho. Hardly were these transactions completed when the Hungarians broke into Germany, but were defeated by Otho on the Lechfeld, near Augsburg (August 10, 955), with such slaughter that they never ventured to renew their invasions. Otho next turned his arms against Berengar, who had revolted. He was crowned King of Italy by the Archbishop of Milan (961), and soon after (962) emperor, by the Pope John XII. The pope took the oath of allegiance to him, and the clergy promised that for the future the choice of pope should always be made in the presence of an imperial commissioner. John soon repented of having given himself a master, and flew to arms while the emperor was yet in Pavia. The latter hastened to Rome, deposed that pontiff, and placed Leo VIII. in the Papal chair. No sooner was Otho returned to Germany than the Romans restored John, and reversed the measures of the emperor, who again appeared in Rome, and punished his enemies. The Byzantine court refused to acknowledge Otho's claim to the imperial dignity; but he defeated the Greek forces in Lower Italy, and the eastern emperor, John Zimisces, gave the Greek Princess Theophania to his son in marriage. Otho died in 973, leaving the reputation of great courage and the strictest integrity. The clergy in Germany were indebted to him for their elevation, which he encouraged to counterbalance the power of the temporal vassals.

OTHO II., youngest son of Otho I. and the fair Adelheid, was born in 955. His elder brothers had all died before their father, who caused him to be crowned King of Rome—the first instance of the kind in German history. He inherited from his father a hasty and unsteady temper, which, while it led him to form great projects, also pushed him forward too impatiently to their execution. Adelheid at first held the reins of government. Otho, disgusted at his state of dependence, left the court, and a war broke out, at the head of which was his cousin Henry II., duke of Bavaria, aided by Harald of Denmark, Boleslas of Bohemia, and Micsislas of Poland. Otho completely humbled the Bohemian duke, and granted the duchy to his nephew Otho of Suabia (978), who thus became the possessor of two great fiefs. Harald, who had made successful incursions into Saxony in two successive years, was eventually totally defeated by the brave Duke Bernhard. Otho afterwards became involved in a war with Lothaire, king of France, for Lorraine. Lothaire attacked him in Aix-la-Chapelle in 978, and Otho was obliged to retreat, but, having collected his forces, drove back Lothaire, laid waste Champagne, and advanced towards Paris, the suburbs of which he burned. By the terms of the peace which was concluded in 980 Lorraine was left in its former relations to the empire. Scarcely was this war ended when he was called into Italy to suppress a rising headed by Crescentius, the self-styled Consul of Rome. After suppressing the revolt and punishing the leaders Otho next attempted to drive the Greeks from Lower Italy; but they called in the Saracens to their aid from Sicily (981), and Otho suffered a total defeat at Basantello in Calabria, 3d July, 982. He himself escaped only by leaping into the sea, where he was picked up by a Greek ship that was sailing by. From this he afterwards made his escape by artifice, but he died soon after at Rome in 983.

OTHO III., son of the preceding, was born in 980, and was only three years old when he was crowned at Aix-la-Chapelle. During his long minority the affairs of the empire were skilfully administered by his mother Theophania, his grandmother Adelheid, and his aunt Matilda, assisted by Willegis, archbishop of Mainz. Profiting by the dissensions among the princes of the imperial family, who disputed the right of these royal ladies to the guardianship of the young king, his uncle, Henry of Bavaria, seized upon his person, and attempted to secure for himself the crown; but being opposed by the majority of the imperial princes he was compelled to give Otho up, and to acknowledge his own subjection, in consideration of receiving back his duchy, forfeited in the preceding reign. Lothaire of France also made a fresh attack upon Lorraine, but was driven back. At the age of fifteen Otho marched at the head of a splendid army into Italy, in order to crush a new insurrection fomented by Crescentius, whom he speedily defeated. On the death of Pope John XV. Otho caused his relative Bruno to be elected pope, under the title of Gregory V., by whom he was consecrated emperor, 21st May, 996. The affairs of Germany recalled him to the north; he defeated the Slaves who had long waged war against the empire, and compelled Micsislas, duke of Poland, to do him homage. As Crescentius had set up a rival pope in the person of John XVI., and driven Gregory from Rome, Otho once more descended upon Italy. Crescentius was again defeated, torn from the castle of St. Angelo, where he had taken refuge, and, with twelve of his principal adherents, beheaded. Pope John fled, but was captured, thrown into prison, and cruelly mutilated. Gregory was restored, and on his death, a short time after, Gerbert, archbishop of Ravenna, Otho's old tutor, was raised to the Papal see, under the title of Sylvester II. The emperor now seems to have cherished the plan of making Rome the capital of his realm, despite the undisguised dissatisfaction of the Italians; he adopted Roman manners and customs, and adorned the city with new buildings. The approach of the year 1000, at which time it had been

prophesied the world was to come to an end, induced Otho to make a pilgrimage to Palestine, where he founded an archbishopric. The same year he paid a visit to the grave of Charlemagne at Aix-la-Chapelle, and took possession of the consecrated golden cross suspended from the neck of the great emperor. In the year 1001 he was again in Italy; he fought several battles in Campania, besieged Benevento, and quelled several outbreaks in Rome. In the following year (1002) he was taken ill near Civita Castellana, and died, not without some suspicion of being poisoned by the wife of Crescentius, in revenge for her husband's death. With Otho the male branch of the Saxon imperial house came to an end.

OTHO, MARCUS SALVIUS, Roman emperor, was descended from an ancient Etruscan family. His father, L. Salvius Otho, was consul in 33 A.D. Marcus Otho was born in the year 32, and passed his youth in luxury and debauchery, being the confidant of Nero. This emperor appointed him proconsul in Lusitania, that he might remove an obstacle to the gratification of his passion for Poppæa Sabina, the wife of Otho, to whose beauty her husband himself had first called his attention. Otho held his place with honour for ten years. He was the first to declare for Galba when he rebelled against Nero, and accompanied him to Rome, where he was made consul immediately after Galba ascended the throne, A.D. 67. As Galba did not adopt him for his successor, and as he was greatly distressed, having squandered away all his fortune, he determined to effect the fall of the emperor. He succeeded, with the assistance of the prætorian bands and the other troops. Galba was murdered, and Otho proclaimed emperor (69 A.D.) But the legions in Germany proclaimed Vitellius. In vain did Otho offer immense sums to gain them to his side. Vitellius refused the offer to reign as joint-emperor, and led his army over the Alps. Otho, for whom most of the provinces had declared, sent against these veteran troops an army of newly-levied soldiers, but commanded by able generals, who defeated, in three battles, the divided army of Vitellius. Elated by his success, and becoming imprudent, Otho determined on a decisive battle against the now united troops of his adversary, and was beaten. Upon receiving information of his misfortune he resolved, by a voluntary death, to end the civil war, and pierced himself with his dagger, after reigning three months and three days.

OTITIS, a term applied to inflammation of the external and also of the internal ear, to which it is generally confined. The symptoms are pain in the internal part of the ear, with tenderness on pressure or on moving the lower jaw, confused hearing, deafness, and more or less of fever. It is not uncommon with children, but is seldom attended with much disturbance of the system. It is generally produced by cold, and occasionally by extraneous bodies that have got into the external passage of the ear, as worms, insects, or their larvæ, &c. It is also brought on by scarlatina and other febrile affections, and occurs most frequently with scrofulous, rheumatic, and gouty constitutions. It is sometimes a serious disease, producing fever and delirium, and ending in suppuration. For its cure in adults copious venesection should be resorted to, and in children leeches. Besides these means fomentations and purgatives, followed by blisters behind the ears, are requisite. When the inflammation abates and suppuration has commenced, warm poultices in a thin cloth should be applied. When the abscess bursts the matter will be discharged through the external passage, and the ear should be as speedily cleared as possible by syringing it with warm milk and water. If the discharge continue for an undue length of time, and the patient appear to be scrofulous, alterative medicines should be employed, and the ear injected daily by a weak solution of the nitrate of silver, say half a grain to an ounce of rose-water.

OTLEY, a small town of England, in the West Riding of Yorkshire, 10 miles north from Bradford, on the south bank of the Wharfe. It has a parish church, built in 1507, and restored in 1868–69; several dissenting chapels, &c.; worsted spinning and weaving, tanning and currying, printing-machine-making are carried on. Pop. in 1881, 6806.

OTOLITHS, or OTOCONIA (Greek, *ous*, ear; *lithos*, stone), the limy or calcareous particles found in connection with the auditory or hearing organ, even in its most rudimentary condition. Thus around the margin of the 'bell' of the Jelly-fishes or Medusidæ (which see) little vesicles filled with a transparent fluid, and containing particles of calcareous matter, are found. These are presumably auditory organs; and in the auditory sacs of higher forms (Annulosa, Mollusca, &c.), concerning the function of which no doubt can be entertained, these otoliths are also present. In fishes generally three otoliths or 'earstones' are found; and in the human ear, as representing the highest perfection of the hearing organ, these calcareous particles are developed, being situated within the cavities (*utriculus* and *sacculus*) of the 'membranous labyrinth.' The functions of these bodies appear to be those of communicating to the auditory membranes and nerves firmer and additional impulses from those which would be derived merely or solely from the fluid in which they are suspended. These particles, in other words, increase the intensity of the vibrations which are communicated through the auditory apparatus to the auditory nerves.

OTRANTO (ancient, *Hydruntum*), a town of Italy, in the province of Lecce or Terra di Otranto, on the strait of same name, 42 miles S.S.E. of Brindisi. It is poorly built, and greatly dilapidated. It has a very ancient cathedral, some Roman antiquities, and a castle, which Walpole's romance has rendered familiar. At its large and commodious harbour there is an active trade with the Levant. Pop. 4000.

OTRANTO, TERRA DI, a province of Naples, forming the heel of the boot to which Italy is usually compared. Excepting on the west and north-west it is wholly washed by the sea, and has several large bays and harbours. The interior is traversed by a branch of the South Apennines, affording excellent pasture, and vegetation, though often injured by drought, is rapid and luxuriant. The principal products are oil, grain, fruit, wine, cotton, and tobacco; area, 2883 square miles. The province is now renamed Lecce. Pop. 554,418.

OTTAR (OTTO, or ATTAR) OF ROSES, an aromatic oil obtained from the petals of *Rosa centifolia* and *Rosa sempervirens* (damask and musk rose). To produce this oil 40 lbs. of the rose flowers, with their calyces, are put into a still with 60 lbs. of water. The mass being well mixed a gentle fire is put under the still, and when fumes begin to rise the cap and pipe are properly fixed and luted. When the impregnated water begins to come over the fire is gradually lessened, and the distillation continued till about 30 lbs. of water are come over, which generally takes place in about four or five hours. This water is to be poured on 40 lbs. of fresh roses, from which are to be drawn from 15 to 20 lbs. of distilled water by the same process as before. It is then poured into porous earthenware vessels, and exposed to the fresh air for a night. The otto will be found in the morning congealed and floating on the surface of the water. It is then skimmed off carefully, freed from any remaining drops of water, and put into bottles for

sale. In the neighbourhood of Mecca the rose petals are macerated in salt and water for two or three days and then distilled, the water being received in separate receivers at different stages of the process. It is stated that 100,000 roses, the produce of 10,000 bushes of the damask rose, yield only 180 grains of otto. It is nearly colourless, has an intense, penetrating, and diffusive smell, and in a concentrated state is far from agreeable, but when diluted very pleasant. This oil is solid and white at the ordinary temperature of the atmosphere; but on the application of heat becomes fluid, and assumes a yellow colour. It consists of two substances, a hydrocarbon (C_nH_{2n}), and an oxygenated oil which has not been analyzed. It has a specific gravity of 0·87, and when burned in oxygen is explosive; 1000 parts of alcohol dissolve only seven parts of otto at 57°, and thirty-three parts at 72°; the solid oil fuses at 203°. Ottar of roses is frequently adulterated with the oils of rhodium, sandal-wood, and geranium, and with camphor and occasionally spermaceti to give the spurious compound the crystalline appearance of the pure oil. Oil of geranium may be detected by adding a little strong sulphuric acid, which does not impair the perfume of otto of roses, but produces with oil of geranium a strong disagreeable odour. If warranted genuine at the English warehouses it fetches from £10 to £20 an ounce. It is imported from the East. In Turkey, Syria, Persia, and India roses are cultivated to a great extent for its sake. The whole country for miles around Ghazipur, in the province of Benares, is a garden of roses. Cashmere, Schiraz, and Damascus are celebrated for the manufacture of ottar of roses.

OTTAVA RIMA (Italian, *octuple rhyme*), a form of versification consisting of stanzas of two alternate triplets, and concluding with a couplet. It seems to have been a favourite form with the old Italian poets even before the time of Boccaccio. That writer clearly recognized its advantages, and wrote his Teseide in this stanza, and has undeservedly got the credit of being its inventor. Since his time all the master-pieces of Italian epic poetry, serious or comic, have been composed in this form. The regular ottava rima is composed of eight endecasillabi piani, that is, eleven syllable lines with dissyllabic rhyme. Ariosto frequently closes his lines on the tenth (an accented) syllable. Among other English poets Lord Byron has employed it (in his Don Juan and Beppo), commonly using, however, ten syllable instead of eleven syllable lines.

OTTAWA, a river, British North America, forming the boundary line between Upper and Lower Canada. It rises in the high land which separates the basin of Hudson's Bay from that of the St. Lawrence, lat. 48° 30′ N. For 300 miles, from its source to Lake Temiscamingue, the Ottawa runs from north-east to south-west; then suddenly changing its direction, it flows to the south-east for 400 miles, widening at its outlet into the expanse of water known as the Lake of Two Mountains, and finally discharges into the St. Lawrence at the St. Anne's Rapids, above the island of Montreal. Six miles above the city of Ottawa the rapids begin, which terminate in the Chaudière Falls, where the water takes a leap of 40 feet. In its course through the table-land the banks are generally high, but below the Chaudière they are much less elevated, and often inundated. It is now navigable from its junction with the St. Lawrence to the falls above named, and to surmount the falls the Rideau Canal has been formed, communicating by means of locks with Kingston. The river is of much importance, from the immense quantity of fine timber cut on its banks, and on those of its tributaries.

OTTAWA, a town in prov. Ontario, capital of the Dominion of Canada, on the Rideau Canal, at the mouth of the Rideau River, and on the right bank of the Ottawa, about 90 miles above its confluence with St. Lawrence, 100 miles west of Montreal. The canal, crossed by a stone bridge, divides the town into Upper and Lower town, both of which are well laid out in wide streets crossing at right angles. The chief public edifices are the government buildings, the corner stone of which was laid by the Prince of Wales in 1860. They are constructed of light-coloured sandstone, in the Italian-Gothic style. They stand on elevated ground commanding a fine view, and form three sides of a quadrangle, the south front being formed by the Parliament building, which is 500 feet long, and contains the halls for the meetings of the Dominion Senate and House of Commons. The wings contain the offices connected with the various departments of the administration. There is a library forming a detached circular building with a dome 90 feet high. The buildings cover about 4 acres, and are said to have cost £800,000. There are a number of churches and educational and charitable institutions. The educational institutions include the Roman Catholic College, the Canadian Institute, and the Mechanics' Institute and Athenæum. The manufactures are considerable, but the lumber trade is the mainstay of the place. The Chaudière Falls in its vicinity, where the Rideau leaps over a precipice into the Ottawa, are an attractive feature. There are several thriving villages in the vicinity, among others New Edinburgh, where Rideau Hall, the residence of the governor-general, is situated. A great accession has been made to the prosperity and importance of Ottawa by its selection as the capital of the confederated provinces. It was founded in 1827 by Colonel By, and up to 1854, when it was incorporated as a city, its name was Bytown. In that year its name was changed to Ottawa, and in 1858 it was selected by the queen as the capital of Canada. The Canadian Parliament was first opened here, on 8th June, 1866. A railway bridge over the Ottawa was opened in January, 1881. Pop. 1881, 27,412.

OTTAWA, a town in the United States, capital of La Salle county, Illinois, at the junction of the Illinois and Fox rivers, 84 miles south-west of Chicago, on the Chicago, Rock Island, and Pacific Railway. It has numerous churches and schools, a large starch factory and other works, and an extensive trade in grain and flour. Rich coal beds are found in the vicinity. Pop. (1880), 7834.

OTTER, a carnivorous mammal included in the family of the Mustelidæ or Weasels, to which it is in structure and general habits nearly allied. The Otters differ from the Weasels chiefly in their aquatic tastes, for which the possession of webbed feet admirably adapts them. The body in the Common Otter (*Lutra vulgaris*), the most familiar member of the group, is of elongated shape, and averages, exclusive of the tail, about 2½ feet in length; the tail being somewhat tapering, but compressed from above downwards, and serving as an efficient rudder to guide the swimming movements of the animal. The legs are short, but muscular, and exceedingly mobile; each foot possessing five webbed toes. The lips are whiskered; the ears being short, and the eyes large and prominent. The under fur is short, closely set, and of woolly character, and serves to protect the body from the water, whilst the outer covering is composed of longer and coarser hairs, of dark-brown hue. In habits the otters are chiefly nocturnal animals, swimming about at night to prey on the fishes, of which they are great destroyers, leaving many fishes mangled after merely eating part of the flesh. The burrow is constructed near the water's edge, the nest being

situated at some depth in the bank of the river. The nest is lined with grass and leaves. From four to five young are produced in June. The incisor teeth number six, and the canines two; the præmolars six, and the molars four in each jaw. The Common Otter inhabits Europe generally, and is a well-known denizen of Scotch rivers and streams. To the salmon it is particularly destructive, a pair of otters destroying an immense number of fish, and, as already remarked, leaving large numbers in a mangled condition after each meal. The pursuit of fishes is carried on with great dexterity by the otters, the lithe body accommodating itself quickly to all the turns and gyrations of the finny prey. The Otter, although usually of an untamable and somewhat ferocious disposition, can occasionally be domesticated to a very perfect extent. A species of Otter (*Lutra nair*) is said to be tamed in India by fishermen, and used for hunting fish (Heber); and in Britain tame otters have occasionally been kept for a similar purpose. The Common Otter may occasionally swim out to sea in search of its prey. It is still hunted for sport by means of dogs known as 'otter-hounds,' which are specially bred and trained to their work. When brought to bay the otter will defend itself with great pertinacity, and will successfully meet any single dog of ordinary strength. When forced to the water the otter swims deftly, and remains for very long periods concealed and swimming beneath the surface. On *maigre* days the Roman Catholic Church permits the flesh of the otter to be eaten. It is said to be dark-coloured, rank, and of fishy taste. The fur is used, but not to any great extent. (Pl. XXXI.–XXXII. figs. 19 and 20.)

The American or Canadian Otter (*Lutra Canadensis*) averages about 4 feet in length, inclusive of the tail. The fur is of a lustrous brown colour. It inhabits America generally, but is most plentiful in Canada, being rare on the Atlantic border of the United States. The Mackenzie River, and other streams running into the Arctic Sea, form noted haunts of the Canadian Otter. In habits it closely resembles the Common or European Otter. It is chiefly noted for its fur, which is much valued commercially. The colour of the fur varies with the seasons. Its winter colour is a deep reddish brown, whilst in summer the fur becomes of a blackish hue. A peculiar winter habit of this otter has been described, as consisting in numbers of these animals enjoying a literal game of sliding. These forms thus select the sloping bank of a river or a ridge of snow, and slide down the sloping surface upon their bellies, the fore-legs being bent backwards, whilst by means of the hind-legs a swift forward impulse is given to the body. This sport may be continued for a considerable time, the whole process reminding one of schoolboys similarly amusing themselves. These animals are caught in steel traps, which are set generally near the entrance to the burrow.

The Sea Otters (*Enhydra*), represented typically by the Great Sea Otter (*E. marina*), inhabit the coasts of the North Pacific Ocean; being thus found in Asia from Kamtschatka to the Yellow Sea; and from Alaska to California, along the coast of America. This form is of comparatively rare occurrence, and although highly valued for its fur the number of skins annually imported into Britain does not exceed 1000. The sea otter averages about 4 feet in length. The tail is short, measuring about 7 inches only. The fur is soft, and of a deep lustrous black, or of a dark maroon colour when dressed. The front parts are of a silvery-gray colour. The legs are short and thick, the ears small and erect; and in general appearance the sea otter somewhat resembles a small seal. The average weight is from 60 to 70 lbs. It lives upon fish, and spends the greater part of its life in the water. Only one young is said to be produced at a time, and the parents are exceedingly devoted to their offspring, defending them at the risk of their lives, and frequently carrying them in their mouths in their endeavours to escape their pursuers. It is caught generally in nets, or by pursuit in boats. The fur of this animal, it may be added, is for the most part sent to Russia and China. In the latter country it is the especial fur of royal personages. A fine skin is valued at about £40, old or less valuable skins being sold by the Russian merchants to the Chinese at from £18 to £20 each. These animals are monogamous; and the young remain with the parents, and are said to suck the mother, until they leave the parents to seek mates for themselves.

OTTOKAR VON STEIERMARK, one of the oldest German historical writers, flourished in the last half of the thirteenth and the beginning of the fourteenth century. He was present at the battle of the Weidenbach, and after having followed Rudolf of Habsburg to Bohemia, he returned to his native province, now freed from the Bohemian yoke, where he gained the favour of Otto of Liechtenstein, the captain-general of Steiermark (Styria). He employed his talents in writing rhymed narratives taken from history. Being called upon to record the most important events of the time he wrote a rhyming chronicle of more than 83,000 lines, which has been printed in the Scriptores rerum Austriacarum of Pez (three vols. 1745). The history treats of the period between the death of Manfred of Sicily (1266) and the accession of the Emperor Henry VII. (1312). The chronicle has little of the poetical spirit which distinguishes some of the earlier works of this nature, but the author knew how to separate truth from fable; and as many of the events came under his own observation, it possesses great value for the historian. Ottokar died about the year 1318.

OTTOMAN EMPIRE, EMPIRE OF THE OSMANLIS (*Osmanli Vilayeti*), comprehends all the territories more or less under the sway of the Turkish sultan, and includes in Europe a considerable portion of the Balkan Peninsula (the Turkish dominions here having been greatly curtailed in modern times), part of this being comprised in the autonomous province of Eastern Roumelia, the tributary principality of Bulgaria, and Bosnia, Herzegovina, &c., held by Austria; in Asia the Anatolian Peninsula or Asia Minor, a portion of Armenia and Kurdistan, Syria, Mesopotamia, &c.; besides Samos, Rhodes, Crete, and other islands; in Africa, Egypt, Nubia, Kordofan, &c., the vilayet of Tripoli and the regency of Tunis. The empire extends over 2,300,000 square miles, with a population of over 47,000,000, of which nearly 9,000,000 belong to Europe, over 17,500,000 to Asia, and about 20,500,000 to Africa. Among recent losses which the European portion of the Turkish empire has sustained may be mentioned Roumania, Servia, Montenegro, Thessaly, &c. For further geographical details see the different countries, EGYPT, SYRIA, TRIPOLI, TUNIS, TURKEY, &c.

It is only since the middle of the sixth century A.D. that history mentions the name of *Turks*. This tribe of Scythian Tartars was then settled on the banks of the Irtish, at the foot of the Altai Mountains, in the steppes of Northern Asia, on the confines of China and Persia, now inhabited by the Kirghis, Bokharians, Usbeks, and Turkomans. They carried on war with the Sassanides and Byzantine emperors, sometimes in alliance with one, sometimes with the other. About the middle of the eighth century the eastern territories of the Turks became subject to China, and the western to Persia, which the Saracens had conquered. They now embraced Mohammedanism, and the Caliph of Bagdad

soon formed of them his body-guard. These military slaves successively supplied to the Saracens generals, to the caliphs *emirs al Omrah* (first ministers, like the Frankish *maires du palais*), and finally sovereign rulers. Thus the Turkish families of the Tulunides and Akshidides reigned in Palestine, Syria, and Egypt, during the ninth and tenth centuries, and that of the Ghaznavides in Persia and India from the end of the tenth to the end of the twelfth century. At the same time a Turkish tribe in Turkestan—the ancient seat of the Scythian Massagetæ, now that of the Tartars, upon the Jaxartes (Sir) and Oxus (Jihon), between Lake Aral and the Caspian—threw off the Chinese yoke, and, under the name of *Seljuks* (from their leader), subdued, in the eleventh century, all Western Asia, where the warlike Togrul Beg, the grandson of Seljuk, Alp Arslan, and Malek Shah founded a powerful empire, with which the Crusaders contended for the possession of Palestine. In 1100 this was divided into Persia, Media, Khorasan, and the country beyond the Oxus; and there arose during the twelfth and thirteenth centuries the Mongols, a race differing entirely from the Tartars, to whom the Turks belong, in language and in manners. In connection with other hordes they destroyed the power of the Seljuks in Asia Minor; and several less powerful Mongol communities arose. But the leaders (emirs) of the Seljuks and Turkomans, who had been driven from their settlements by the Mongols, soon sallied forth from the valleys of Mount Taurus, and divided Asia Minor among themselves. One of these emirs was Othman or Osman (that is, *bone-breaker*), of the race of the Oghuzian Turkomans. With his horde of some 100 Tartar families from the Caucasus he forced (1299) the passes of Olympus, where about 800 Turkoman families still remain, and pitched his camp in the plain of Bithynia, under the protection of the Seljuk sultan of Iconium. Reinforced by robbers, runaway slaves, and prisoners, he plundered the surrounding country, and took several provinces of Asia Minor from the Eastern Empire of the Romans. After the death of his protector in the year 1300 (618 of the Hegira) he proclaimed himself sultan. He died in 1326.

Thus a bold and successful captain of a band of robbers, unobstructed by the weak and divided Byzantines, founded upon the ruins of the Saracen, Seljuk, and Mongol power the Empire of the Osman or Ottoman Turks in Asia; and after him, the courage, policy, and enterprise of eight great princes, whom the dignity of caliph placed in possession of the standard of the prophet, and who were animated by religious fanaticism and a passion for military glory, raised it to the rank of the first military power in Europe (1300–1566). The first of them was Orkhan, son of Osman. In the year 1326 he fixed his residence in Brussa, capital of Bithynia, which he had conquered shortly before his father's death. He organized a valiant infantry (the Janizaries), which he kept in constant pay, formed in part of Christian slaves brought up in the Mohammedan faith and the practice of arms. He subdued all Asia Minor to the Hellespont, and took the name of *Padishah*. He became son-in-law to the Greek Emperor Cantacuzenus. This circumstance, and an alliance with the Genoese, who, from rivalry with the commerce of the Venetians, so powerful in the Levant, alternately courted the emperors of Constantinople and the powerful sultan of the Asiatic coast, and lent their ships to the Turks for transportation, made known to Orkhan and his successors the weakness of the Eastern Empire and the divisions of the Western, where religious schisms and the feudal system had destroyed all civil order, and where there was no authority or policy to hold together the whole. Asia no longer feared a crusade. More wise and intelligent than the padishahs of the eighteenth and nineteenth centuries, Orkhan and his successors resolved to reduce feeble and divided Europe under the law of the prophet.

Orkhan's son, the brave Soliman, first invaded Europe in 1355. He fortified Gallipoli and Sestos, and thereby held possession of the straits which separate the two continents. The Ottoman armies now spread at the same time over Europe and Asia. In 1360 Orkhan's second son and successor, Amurath I., took Adrianople, which became the seat of the empire in Europe, and conquered Macedonia, Albania, and Servia with his janizaries, together with the Timariots and Zaims, who, as vassals, were obliged to perform cavalry service. A confederacy of the Slavonian tribes of the Upper Danube was formed against him, and, joined by numerous warriors from Hungary and Italy, they marched into Servia to give him battle, but were defeated with enormous slaughter at Kossova (1389); the sultan was, however, assassinated towards the close of the day. After him the ferocious Bajazet, surnamed Ilderim (*Lightning*), invaded Thessaly, and advanced to Constantinople. September 28, 1396, he defeated the Western Christians under Sigismund, king of Hungary, at Nicopolis, in Bulgaria; built a strong castle on the Bosporus, and imposed a tribute upon the Greek emperor; but the arms of Timour called him back to Asia; and in the battle of Angora in 1402 the proud Bajazet was conquered and taken prisoner. Timour divided the provinces between the sons of Bajazet. Finally, in 1413, the fourth son of Bajazet, the wise and just Mohammed I., seated himself upon the undivided throne of Osman. In 1415 his victorious troops reached Salzburg and invaded Bavaria. He conquered the Venetians at Thessalonica in 1420; and his celebrated grand-vizier Ibrahim created a Turkish navy. He was succeeded by his son, the wise and valiant Amurath II. The brave George Castriot in Epirus (Scanderbeg, that is, Prince Alexander), the heroic John Huniades, prince of Transylvania, and the fortress of Belgrade, the bulwark of the West, alone resisted him. After the conclusion of peace in 1440 he laid down the reins of government; but the pope having absolved Ladislaus, king of Hungary and Poland, from his oath, and the Christians having penetrated to the borders of the Black Sea, Amurath advanced to meet them, and conquered them at Varna in 1444. Ladislaus and Julian, the legate of the pope, were among the slain. The great Amurath again abdicated the throne, and was again recalled to it by danger. He humbled the pride of the janizaries, and conquered the Christians at Kossova in 1449.

The Byzantine Empire was already cut off from the West when Mohammed II., the son of Amurath, and his successor, at the age of twenty-six, completed the work of conquest (1451–81). He attacked Constantinople, which was taken May 29, 1453; and the last Palæologus, Constantine XI., buried himself under the ruins of his throne. Since that time the city has been the residence of the Sublime Porte. Mohammed now built the castle of the Dardanelles, and organized the government of the empire, taking for his model Nushirvan's organization of the Persian Empire. In 1456 he subdued the Morea, and in 1461 led the last Comnenus, emperor of Trebizond, prisoner to Constantinople. Pius II. called in vain upon the nations of Christendom to take up arms. Mohammed conquered the remainder of Bosnia in 1470, and Epirus in 1465, after the death of Scanderbeg. He took Negropont and Lemnos from the Venetians, Caffa from the Genoese, and in 1473 obliged the khan of the Crim Tartars, of the family of Genghis-Khan, to do him homage. In 1480 he had already conquered

Otranto, in the Kingdom of Naples, when he died, in the midst of his great projects against Rome and Persia. His grandson, Selim I., who had dethroned and murdered his father, drove back the Persians to the Euphrates and the Tigris. He defeated the Mamelukes, and conquered in 1517 Egypt, Syria, and Palestine. Mecca submitted to him, and Arabia trembled.

During fifty years the arms of the Ottomans by sea and by land were the terror of Europe and of Asia, especially under Soliman II., the Magnificent, also called the *Lawgiver*, who reigned between 1519 and 1566. In 1522 he took Rhodes from the knights of St. John, and by the victory of Mohacz in 1526 subdued half of Hungary. He exacted a tribute from Moldavia, and was successful against the Persians in Asia so as to make Bagdad, Mesopotamia, and Georgia subject to him. He was already threatening to overrun Germany and to plant the standard of Mohammed in the West when he was checked before the walls of Vienna (1529). His admirals Hair-ed-din and Aruch (see BARBAROSSA) swept the Mediterranean, conquered Northern Africa, and laid waste Minorca, Sicily, Apulia, and Corfu. The projects of the conqueror were rendered abortive by the policy of Charles V. He was resisted at sea by the Venetians, and the Genoese Andrew Doria, by the grand-master Lavalette in Malta, and by Zriny under the walls of Szigeth in Hungary.

Ten sultans, all of them brave and warlike, and most of them continually victorious, had now during a period of two centuries and a half raised the power of the Crescent; but the internal strength of the state was yet undeveloped. Soliman, indeed, by his laws, completed the organization begun by Mohammed II., and in 1538 united the priestly dignity of the caliphate to the Ottoman Porte; but he could not incorporate into a whole the conquered nations. He also imprisoned his successor in the seraglio—an education as little adapted to produce heroes as statesmen. From this time the race of Osman degenerated, and the power of the Porte declined. From Soliman's death, in 1566, to our time very few of the sultans who have reigned have been distinguished by ability of any kind, and least of all by military courage. These sovereigns ascended the throne from a prison, and lived in the seraglio until, as not unfrequently happened, they again exchanged the throne for a prison. Several grand-viziers alone upheld the falling state, while the nation continued to sink deeper into the grossest ignorance and slavery. Pashas, more rapacious and more arbitrary than the sultan and his divan, ruled in the provinces. In its foreign relations the Porte was the sport of European politicians, and more than once was embroiled by the cabinet of Versailles in a war with Austria and Russia. While all Europe was making rapid progress in the arts of peace and of war, the Ottoman nation and government remained inactive and stationary. Blindly attached to their doctrines of absolute fate, and elated by their former military glory, the Turks looked upon foreigners with contempt as infidels (*giaours*). Without any settled plan, but incited by a savage hatred and a thirst for conquest, they carried on the war with Persia, Venice, Hungary, and Poland. The revolts of the janizaries and of the governors became dangerous. The suspicions of the despot were quieted with the dagger and the bow-string, and the ablest men of the divan were sacrificed to the hatred of the soldiery and of the ulema, or theological jurists. The successor to the throne commonly put to death all his brothers; and the people looked with indifference upon the murder of a hated sultan or the deposition of a weak one.

Mustapha I. was twice dethroned (1618 and 1623); Osman II. and Ibrahim were strangled, the former in 1622, the latter in 1648. Selim II., indeed, conquered Cyprus in 1571, but in the same year Don John of Austria defeated the Turkish fleet at Lepanto. A century after, under Mohammed IV., in 1669, Candia was taken after a resistance of thirteen years; and the vizier Kara Mustapha gave to the Hungarians, who had been oppressed by Austria, their general, Count Tekeli, for a king, in 1682; but the very next year he was driven back by John Sobieski from Vienna, which he had besieged, and after the defeat at Mohacz, in 1687, the Ottomans lost most of the strong places in Hungary. The exasperated people threw their sultan into prison. In a short time the grand-vizier, Köprili or Kiuprili Mustapha, restored order and courage, and recalled victory to the Turkish banners; but he was slain in the battle against the Germans near Salankemen in 1691. At last the Sultan Mustapha II. himself took the field, but he was opposed by the hero Eugene, the conqueror at Zenta in 1697; and on the Don, Peter the Great conquered Azov. He was obliged, therefore, by the Treaty of Carlowitz in 1699, to renounce his claims upon Transylvania and the country between the Danube and the Theiss, to give up the Morea to the Venetians, to restore Podolia and the Ukraine to Poland, and to leave Azov to the Russians. Thus began the fall of the Ottoman power. A revolt of the janizaries, who, abandoning their ancient rigid discipline, wished to carry on commerce and live in houses, obliged the sultan to abdicate. His successor, the imbecile and voluptuous Achmet III., saw with indifference the troubles in Hungary, the war of the Spanish Succession, and the great Northern war. Charles XII., whom he protected after his defeat at Pultawa, finally succeeded in involving him in a war with Peter; but the czar, although surrounded with his whole army, easily obtained the Peace of the Pruth, by the surrender of Azov in 1711. In 1715 the grand-vizier attacked Venice and took the Morea; but Austria assisted the republic, and Eugene's victories at Peterwardein and Belgrade (1717) obliged the Porte to give up, by the Treaty of Passarowitz in 1718, Temeswar, Belgrade, with a part of Servia and Walachia: it still retained the Morea. Equally unsuccessful were Achmet's arms in Persia: in consequence of which an insurrection broke out, and he was thrown into prison in 1730. In 1736 the Russian general Munich humbled the pride of the Ottomans; but Austria, the ally of Russia, was not successful, and the French ambassador in Constantinople effected the Treaty of Belgrade (in 1739), by which the Porte regained Belgrade, with Servia and Walachia.

After a peace of thirty years Mustapha III. became conscious of the rising greatness of Russia, and required Catharine II. to withdraw her troops from Poland, but the victories of Romanzoff in the war between 1768 and 1774 determined the political superiority of Russia. At the same time a Russian fleet was victorious on the Grecian seas, and Alexis Orloff called the Greeks to freedom—an unsuccessful attempt, indeed; yet Abdul-Hamid at the Peace of Kutschuk-Kainargi, in 1774, was obliged to renounce his sovereignty over the Crimea, to yield to Russia the country between the Bog and the Dnieper, with Kinburn and Azov, and to open his seas to the Russian merchant ships. But the pride of the humbled Porte was aroused by the rapacious spirit of Russia, and the divan in 1787 declared war against Catharine II. The war, however, was carried on during the reign of Selim III. with so little success that Russia, by the Peace of Jassy (1792) retained Taurida and the country between the Bog and the

Dniester, together with Otchakov, and gained some accessions on the Caucasus. Austria, also, to which the Porte in 1777 had ceded the Bukowina, a part of Moldavia, had declared war in favour of Russia, but was induced by the threats of Prussia to restore Belgrade at the Peace of Sistora in 1791.

At this time the internal confusions of the Turkish Empire were continually increasing. Selim III. was not deficient in understanding or in knowledge, but he had not energy to effect a thorough reform. There was no other connection between his wide extended realms than faith in the caliphate of the padishah, and fear of the power of the grand seignior. The former was shaken by the sect of the Wahabees (Wahabites—not reduced till 1818), and the latter thrown off by several bold governors of the provinces. Among these petty sultans were Passwan Oglou in Widdin (Viddin), Jussuff (until 1810) in Bagdad, several pashas in Anatolia, &c., Ali, pasha of Janina, and Ali Bey, in Egypt. The Servians wished for a native hospodar; thence arose continual insurrections and continual acts of tyranny. On the other hand a spirit of freedom manifested itself in Greece by impotent efforts, but in Servia by a vigorous resistance between 1801 and 1814. Finally, in March, 1821, the Greek nation arose to shake off the Turkish yoke.

Turkey was equally perplexed in her foreign relations. She had been mistrustful of France ever since the alliance of that country with Maria Theresa in 1756. She remained a quiet spectator of the outbreak of the revolution, and the grand-vizier had hoped that the republic would not unite with Austria. The divan, however, observed conscientiously the existing treaties, and neither in Asia nor in Europe took advantage of the favourable opportunities for restoring the ancient power of the Ottomans by a war against Persia or against Austria. At the same time Russia stood ready upon the heights of Caucasus and at the mouths of the Danube. Bonaparte's campaign in Egypt finally raised the indignation of the Porte, which, September 1, 1798, declared war for the first time against France. By its alliance with Russia in December, 1798, and with England and Naples in January, 1799, it now fell under the direction of the cabinets of St. Petersburg and St. James. A Russian fleet sailed through the Dardanelles, and a Turkish squadron, in co-operation with it, conquered the Ionian Islands. Paul I. and Selim III., by a treaty at Constantinople (March 21, 1800), formed the Republic of the Seven Islands, which, as well as Ragusa, was to be under the protection of the Porte. In the following year England restored Egypt to the Porte; but the Mameluke beys and the Arnaouts filled the land with tumult and bloodshed, until on the 1st of March, 1811, the new governor, Mehemed Ali Pasha, entirely exterminated the Mamelukes by treachery, and long governed Egypt quite independently. The union with the European powers had, however, made Selim and some of the chiefs of the empire sensible that, if the Porte would maintain its power, it must introduce into its armies the modern tactics, and give to the divan a form more suited to the times. Attempts were made therefore to form a Turkish army on the European model, which should supersede the janizaries. But after the peace with France, in 1801, there were in the divan two parties—a Russian and British, and a French. The superiority of Russia pressed upon the Porte in the Ionian Islands and in Servia; it was therefore inclined to favour France. When, therefore, Russia in 1806 occupied Moldavia and Walachia the old hostility broke out anew, and, December 30, 1806, the Porte, at the instigation of France, declared war against Russia, which was already engaged with Persia and France. The weakness of the Ottoman Empire was now evident. A British fleet forced the passage of the Dardanelles, and, February 20, 1807, appeared before Constantinople; but the French general Sebastiani directed with success the resistance of the divan and of the enraged people. On the other hand the Russians made rapid advances. The people murmured. Selim III., May 29, 1807, was deposed by the mufti, and Mustapha IV. was obliged to put a stop to the hated innovations. But after the Turkish fleet had been entirely beaten by the Russians at Lemnos, July 1, 1807, Selim's friend, Mustapha Bairaktar, the brave pasha of Rustchuk, took advantage of the terror of the capital to seize it. The unhappy Selim lost his life July 28, 1808; and Bairaktar, in the place of the deposed Mustapha IV., raised to the throne Mahmoud II. (born in 1785). As grand-vizier of Mahmoud he restored the new military system, and concluded a truce with Russia; but the fury of the janizaries again broke out, and destroyed him and his work, November 16, 1808.

Mahmoud alone now supported the throne; for he was, since the death of Mustapha IV., the only prince of the family of Osman. He soon showed extraordinary courage and prudence. He concluded peace with Great Britain Jan. 5, 1809, and continued with redoubled vigour the war against the Russians, who already threatened the passages of the Balkan. Twice (1810 and 1811) the Russians were obliged to retreat beyond the Danube; nevertheless their policy conquered the French party in the divan. In vain had the French Emperor, in his treaty with Austria, March 14, 1812, declared that he would maintain the integrity of the Turkish territory. Notwithstanding this, before the French army had passed the Niemen the sultan bought peace with Russia, May 28, 1812, at Bucharest, by ceding that part of Moldavia and Bessarabia which lies beyond the Pruth, with the northern fortresses on the Dniester and at the mouths of the Danube, and the southern gates of the Caucasus on the Kur. The Servians, left to themselves, again became subjected to Turkey. They retained, however, by their treaty with the Porte in November, 1815, the administration of the government. In 1817 Mahmoud was obliged to give up the principal mouth of the Danube to Russia. But the Greek insurrection again disturbed the relations of the two powers, and produced important changes in the situation of the Porte. The Porte believed that Russia secretly favoured the insurrection, and therefore seized Moldavia and Walachia, and restricted its maritime commerce. Both were open violations of the Peace of Bucharest. After an interchange of notes the Russian ambassador left Constantinople. The mediation of the British and Austrian courts, together with the Emperor Alexander's desire for peace, prevented the outbreak of a war; but the divan, under various pretexts, refused all satisfaction to the Russian cabinet, until at last the Emperor Nicholas declared the Russian *ultimatum*, upon which the Porte, May 14, 1826, granted all the demands of the Russian court, and promised that in Moldavia and Walachia (where in three years it had raised 37,000,000 of piastres, which were employed in the war against the Greeks) everything should be replaced on its former footing, and sent commissioners to Akerman. Here a final term was again fixed for the decision of the divan, and October 6, 1826, eighty-two articles of the Russian ultimatum were accepted. This Treaty of Akerman carried into effect the Peace of Bucharest. The Porte surrendered to Russia the fortresses in Asia which it had hitherto held back, and acknowledged the privileges granted by Russia to Servia, Moldavia, and Walachia.

In the meanwhile the Porte had begun its internal reform, and it was resolved utterly to exterminate the janizaries, who had lately burned the suburb of Galata, from the 3d to the 5th of January, 1826. An army was formed upon the European system, and in June, 1826, the body of janizaries was destroyed after a bloody struggle. The violence employed in the execution of this and other measures caused an insurrection, in which (August 31 and October 11) 6000 houses were burned in Constantinople. Instead of military insubordination, the most rigid military despotism began, which did not spare even the ulema. At the same time, the Porte, in June, 1827, firmly refused the offered mediation of Russia, Britain, and France, in its war with the Greeks, and the grand seignior called all his subjects (Christians included) to arms, to fight, if necessary, against all Europe. After the fall of the Acropolis (June 5, 1827) Reschid Pasha came into possession of Livadia. East and West Hellas again submitted to the Crescent. The remonstrances of Britain, France, and Russia against the cruelties with which the war against the Greeks was carried on proving of no avail, those powers attacked and destroyed the fleet of Mahmoud at Navarino (20th Oct. 1827). This event secured the independence of Greece. The war between Turkey and Russia, which began in 1828, and was terminated by the peace of Adrianople, 14th Sept. 1829, greatly enfeebled the Porte; and Mehemet Ali, nominally Pasha of Egypt, but real lord both of that and Syria, levied war against his sovereign in 1833, and advanced to Kutaya, in Anatolia, distant only 120 miles from Constantinople; when the Russians, who had been called on for their aid by the sultan, forced the invaders to desist. The Russians profited by this occasion to conclude the treaty of Hunkiar-Skelessi, in which it was (*inter alia*) stipulated that the Dardanelles were to be for ever closed against the armed vessels of all nations which Russia may consider her enemies. The sultan persevered in his reforming system till his death, which took place in 1839. He was succeeded by his son, Abdul Medjid Khan. In 1840 Mehemet Ali levied war against the new sultan; but this was soon put an end to (though not till his forces had been utterly routed by Ibrahim Pasha) through the active intervention of Great Britain, Austria, and Russia. In terms of the convention which ensued Mehemet Ali evacuated Syria, which had been several previous years under his rule, and he was, in recompense, recognized as hereditary viceroy of Egypt, conditionally on his doing homage and paying a yearly tribute to the sultan.

The next important event in the history of the Ottoman Empire was the war with Russia in which Turkey became involved in 1853, and in which she was joined by England and France in the following year. An account of the origin and progress of this war, known as the Crimean war, will be found in the article CRIMEA, and it is therefore enough to say here that it terminated with the defeat of Russia, and the conclusion of a treaty at Paris on the 30th of March, 1856, by which the influence of Russia in Turkey was greatly reduced. The principal articles were the abolition of the Russian protectorate over the Danubian principalities, the government of which was to be reorganized under the sovereignty of the Porte; the rectification of the frontier between Russia and Turkey, and the cession of part of Bessarabia to the latter power. On the 25th June, 1861, Abdul Medjid Khan died, and was succeeded by his brother, Abdul Aziz Khan, the close of whose reign, otherwise uneventful, was darkened by the commencement of that series of events which led to the recent disasters of Turkey. In the summer of 1875 the people of Herzegovina, unable to endure any longer the misgovernment of the Turks, broke into rebellion. A year later the Servians and Montenegrins likewise took up arms, and though the former were unsuccessful and obliged to abandon the war, the Montenegrins still held out. In the midst of these events Abdul Aziz was deposed (May 30, 1876), and a few days later he committed suicide. The successor to him first appointed, Murad V., was himself deposed on the 31st of August in the same year, and was then succeeded by Abdul Hamid II. Meantime the great powers of Europe were pressing reforms on Turkey, and at the end of 1876 a conference met at Constantinople with the view of making a fresh settlement of the relations between her and her Christian provinces. All the recommendations of the conference were, however, rejected by Turkey; and in April following, Russia, who had been coming more and more prominently forward as the champion of the oppressed provinces and had for months been massing troops on both the Asiatic and the European frontier of Turkey, issued a warlike manifesto and commenced hostile operations in both parts of the Turkish empire. She was immediately joined by Roumania, who on the 22d of May declared her independence. The progress of the Russians on the European theatre of war was at first rapid. On the 27th of June they crossed the Danube unresisted at Sistova, and on the 12th of July a Russian army passed the Balkans, and though afterwards driven back it succeeded in maintaining itself in the Shipka Pass. But soon after the eastern army sustained severe reverses before the heights of Plevna, on a northern spur of the Balkans in Bulgaria. There the Turks had fortified themselves with great skill, and there they held out against repeated attacks of the Russians and Roumanians till the position was stormed on the 10th of December. Previously to this the Asiatic campaign also had turned out favourably for Russia. Kars was taken on the 18th of November, and the whole of Armenia was left open to the invaders. After the fall of Plevna the Turkish resistance in Europe as in Asia completely collapsed, and, 3d of March, 1878, Turkey was compelled to agree to the treaty of San Stefano, in which she accepted the terms of Russia. The provisions of this treaty were, however, considerably modified by the treaty of Berlin concluded on the 13th of July following by a European congress, and it is on this treaty that the present settlement of Turkey is based. By it Roumania, Servia, and Montenegro were declared independent, and the territories of the two latter were increased; Roumanian Bessarabia was ceded to Russia, in compensation for which the Dobrudsha was handed over to Roumania; Austria was empowered to occupy Bosnia and Herzegovina in order to maintain peace and order; Bulgaria north of the Balkans was erected into a principality under the protection of Turkey, and Bulgaria south of the Balkans was made an autonomous province under the name of Eastern Rumelia; finally, in Asia Russia received a portion of Armenia including Batum. On the 4th of June previous England had concluded a convention with Turkey giving her the right to occupy Cyprus, which island she soon after occupied. Since the conclusion of this treaty Turkey has transferred a large part of Thessaly to Greece.

OTWAY, THOMAS, an English writer of tragedy, was born in 1651 at Trotting, or Trotton, in Sussex, his father being the rector of Woolbeding, in that county. He was educated at Winchester and Oxford, but left the university without a degree. He went to London, and made some attempts as an actor, but with little success. In 1675 he produced his first tragedy of Alcibiades. The following year appeared his Don Carlos, which proved extremely successful. His theatrical reputation introduced him to the

patronage of the Earl of Plymouth, a natural son of Charles II., who procured him a cornetcy in a regiment of cavalry destined for Flanders, in which country he served for a short time and then returned, pursued by his habitual poverty. He continued to write for the stage, but found it a very scanty means of subsistence. He produced, in 1677, Titus and Berenice, from Racine, and the Cheats of Scapin, from Molière, which were acted together as play and farce, and succeeded. The following year he produced his Friendship in Fashion, a comedy, which was followed, in 1680, by his tragedies of Caius Marius and the Orphan, and in 1682 by Venice Preserved, on which last two pieces his dramatic fame is chiefly founded. His comedies were coarse and licentious, even for that day. He died in 1685, in his thirty-fourth year, at a public-house on Tower Hill, where he had secreted himself from his creditors, in a state of great destitution. As a tragic writer he is deservedly esteemed for the force and feeling with which he depicts domestic distress. His tragedy of Venice Preserved still maintains its place on the stage.

OUDENARDE, or AUDENARDE, a town of Belgium, in the province of East Flanders, on the Scheldt, supposed by some to have been built by the Goths about the year 411; 15 miles south of Ghent, and 24 miles north-east of Lille. It is fortified, well built, and has a handsome Gothic town-house; and manufactures of woollen, linen, and cotton goods, tobacco, lace, together with iron foundries, distilleries, breweries, &c. It has sustained several sieges, but is best known in history by the memorable victory gained over the French on the 11th of July, 1708, by Prince Eugene and the Duke of Marlborough. Pop. 6250.

OUDH, or OUDE (in Sanskrit, *Ayodhyá*), a former province of British India, bounded on the north by Nepaul, and on other sides surrounded by the North-west Provinces of the Presidency of Bengal; with which it was amalgamated on the 17th of January, 1877; area, 24,251 English square miles. The surface is mostly level, and highly fertile; it is watered by the Ghogra, Gumti, Sye, and other tributaries of the Ganges, all of which have a general south-east course. The Ganges itself forms nearly all its southern boundary. Wheat, barley, rice, sugar, indigo, and others of the richest products of India, are raised in large quantities; and in some districts a vast amount of nitre and other salts effloresce on the soil. Some parts of the country are in high and fine cultivation; but large parts are overgrown with jungle. Amongst the inhabitants are numerous Rajputs; and many of the population are Mussulmans. Oudh was formerly a Mogul province, and was surrounded by the provinces of Delhi, Agra, Allahabad, and Bahar. It became subordinate to the British after the battle of Kalpee, in 1765. In 1801 there were annexed from this territory to the British dominions Gorakhpur, and some other eastern districts; and by the treaty of the same year the vizier agreed to maintain in his own pay only four battalions of infantry and 2000 cavalry, besides a few guards, armed collectors, and irregular troops; and to pay to the Anglo-Indian government an annual subsidy of 760,000 rupees (£76,000), from which the British supported a subsidiary force of 10,000 men, including Europeans. In 1819 the vizier threw off his nominal dependence on the Mogul sovereign, and assumed the title of king. A disputed succession, and partial revolt in 1837, were the chief subsequent events until 1856, when the complaints of the misgovernment of the King of Oudh led to the annexation of the country to the British dominions, an annual pension of £120,000 being settled on the king. This measure, however, produced much dissatisfaction, and when, in 1857, the mutiny broke out, most of the Oudh sepoys joined it, and the siege of Lucknow resulted. (See INDIAN MUTINY.) After the pacification of the province it gradually regained prosperity, and under the judicious reforms introduced it has continued to progress. Schools have been established; in 1877–78 there were 1423 in operation, with 64,571 scholars. The revenue derived from the province in 1877–78 was £1,609,085, and the expenditure £570,422. Since the amalgamation with the North-West Provinces no separate reports have been issued. Lucknow is the capital; the other principal places being Faizabad, Shahabad Bharaich, and Khyrabad. Pop. (1881), 11,220,950, giving the large average of 463 to the square mile.

OUDH, a town, and the former capital of the province of Oudh, on both banks of the Ghogra, 77 miles east of Lucknow. It is greatly venerated by Hindus; but its ancient temples are in ruins, and its only structures deserving notice are a mosque built by Aurungzebe, some Mohammedan tombs, and an iron bridge across the river. Pop. 8000.

OUDINOT, CHARLES NICOLAS, Duke of Reggio, a peer and marshal of France, was born at Bar-le-Duc in 1767. In his sixteenth year he enlisted as a volunteer in the regiment of Medoc, but at the request of his family quitted it in 1787. The revolution furnished him with an opportunity of gratifying his warlike bent. In 1791 he was elected commandant of a volunteer battalion, and gave striking proofs of valour. For his defence of the castle of Bitsche against the Prussians in 1792 he was appointed colonel of the regiment of Picardy. At its head he defended himself in 1793 against a body of the enemy 10,000 strong for four hours, and was advanced to the rank of brigadier-general. While fighting on the Rhine he received four severe wounds, and in 1799 obtained the rank of a general of division. Masséna made him chief of the general staff, and by his aid gained a victory near Zürich. After the 18th Brumaire Oudinot accompanied him in the same capacity to Italy, where he added greatly to his fame by several bold sallies during the siege of Genoa. He also decided the battle of Mincio, having with some soldiers made a dash at a formidable Austrian battery, and carried it. In 1804 Napoleon gave him the command of a grenadier corps of 10,000 men, which was to form the advance-guard of the main body. At the head of these troops he opened the campaign of 1805. He drove back a strong Austrian corps at Wertingen, and by a series of bold manœuvres contributed essentially to the successes at Ulm. After reaching Vienna he crossed the Danube at the bridge of Tabor, and defeated the Austrians, capturing 180 guns and several battalions. Having been wounded in the affair of Hollabrunn, he was sent in 1806 to take possession of Neufchâtel, which had been ceded by Prussia. At Friedland he withstood the Russian army till Napoleon came up with the main body and completed the victory. After the Peace of Tilsit he was made a count, and obtained a grant. He opened the campaign of 1809, and gave a succession of defeats to the Austrians at Paffenhofen, Ried, Ebersberg, and Vienna. At the battle of Essling he succeeded Lannes in the command of the second army corps, and helped to gain the battle of Wagram. Napoleon now made him a marshal and Duke of Reggio, and gave him an estate worth £4000 a year. In 1810 he was ordered to take possession of Holland with his corps, and executed the difficult commission with prudence and moderation. On the opening of the Russian campaign in 1812 he was for a short time governor of Berlin. He then crossed the Niemen with the second army corps, and

drove the Russians from their fortified position at Poloczk. After fighting a series of bloody battles against Wittgenstein in maintaining this point, he was obliged in consequence of severe wounds to resign his command to St. Cyr. In leading the retreat of the army from Moscow he endeavoured to keep the passage of the Berezina open; but was not able to prevent the destruction of the Berezina Bridge. In the campaign of 1813 he led the 12th army corps. After the armistice of Pläswitz he received the command of three united corps, and endeavoured to push forward to Berlin; but was defeated at Grossbeeren by the Crown-prince of Sweden, and ordered in consequence to give up his command to Ney, whose defeat he shortly after shared at Dennewitz. At Leipzig he commanded two divisions of the Young Guard. Severe wounds, accompanied with sickness, obliged him to quit the army; but he again in 1814 took his place at the head of the Young Guard. After Napoleon's abdication he gave in his adhesion to the Bourbons, who made him a peer and a minister of state, and gave him the command of the twenty-fifth military division. During the Hundred Days he remained quiet on his estates, and on the second restoration was appointed major-general of the Royal Guards, and commandant of the National Guard of Paris. In the Spanish campaign of 1823 he commanded the first army corps, and was appointed governor of Madrid. As a supporter of the July revolution he was made by Louis Philippe high chancellor of the Legion of Honour, and in 1842 succeeded Moncey as governor of the Hôtel des Invalides. This appointment he held till his death in 1847.—His eldest son, NICOLAS CHARLES VICTOR (born 1791), commanded the troops sent by the French Republic in 1849 against Rome, and held possession of it for the pope. In spite of the heroic resistance of the patriots, headed by Garibaldi, Mazzini, and Saffi, the city was obliged to surrender unconditionally. On the accession of Napoleon III. he was deprived of his command, and ceased to take a share in public affairs. He died in 1863.

OUNCE (Latin, *uncia*, a twelfth part of any magnitude, whether of length, surface, or capacity; hence the Italian *oncia*, signifying inch as well as ounce), a designation of weight. In Troy weight the ounce is the twelfth part of the pound, and weighs 480 grains; in avoirdupois the ounce is the sixteenth part of a pound, and weighs 437½ grains Troy.

OUNCE (*Felis Uncia*), one of the Digitigrade Carnivora, found in Northern Africa, Arabia, Persia, India, and China. The length of the body is about 3½ feet, the tail measuring about 2 feet. The body is elongated, the limbs being of shorter conformation than in its allies. The general body fur consists of long hairs, coloured a yellowish gray. The head bears numerous small black spots of round shape. A larger patch exists behind each ear. The back bears oval patches, each consisting of a collection of smaller spots, whilst those on the sides are more irregularly disposed, and those of the thighs and legs are smaller still. The tail, particularly on its upper aspect, is marked by irregular patches of a black colour. In habits the ounce resembles the leopard. It is trained to hunt like the Cheetah, or Hunting Leopard, and in such a case becomes completely tamed and domesticated. By some authorities the ounce is regarded as merely the young state of the leopard, but this opinion decidedly requires confirmation.

OURO-PRETO, or VILLA-RICA, a town of Brazil, capital of the province of Minas-Geraes; situated on a series of heights at the base of the serra of its name, 190 miles N.N.W. of Rio-de-Janeiro. It is surrounded by lofty barren mountains, and is composed of narrow, crooked, irregular, and ill-paved streets. The principal buildings are the governor's residence, more resembling a fortress than a palace, and partly occupied by the offices of the civil and military authorities of the province; five churches, the town-house, the treasury, barracks, and theatre. It possesses a public library, a botanical garden, with a normal school of agriculture attached; and a college, with chairs of Latin and Portuguese, pharmacy, and anatomy. An active trade is carried on with Rio-de-Janeiro, and with the towns in the north and east of the province. Its gold mines, now nearly exhausted, have been long worked by an English company. Pop. 20,000.

OUSE, called also NORTHERN or YORKSHIRE OUSE, to distinguish it from other rivers of the same name, a river of England, in the county of York, formed by the junction of the Swale with the Ure near Boroughbridge; it flows tortuously south-east past York, Selby, and Goole; and unites with the Trent 8 miles east of the last-mentioned town, to form the estuary of the Humber. Its total course is 60 miles; for the last 45 of which (or to York) it is navigable for large vessels, and for barges as far as Linton. Its principal affluents are the Wharfe and the Aire from the west, the Don from the south, and the Derwent from the north.

OUSE, GREAT, a river of England, rises near Brackley in the county of Northampton, flows in a general north-easterly direction, traverses the counties of Buckingham, Bedford, Huntingdon, Cambridge, and Norfolk, and falls into the Wash at King's Lynn, after a course of about 160 miles, for the latter two-thirds of which it is navigable. Its chief affluents are the Ivel, Cam, Larke, Little Ouse, Stoke, and Nar.

OUTLAWRY is the putting one out of the protection of the law. Anciently, in Britain an outlawed felon was said to have *caput lupinum* (a wolf's head), and might be knocked on the head like a wolf by any one that should meet him; for having himself renounced or evaded the law he was to lose its protection, and be dealt with as in a state of nature, where every one that should find him might slay him. But the inhumanity of the law in this respect had become softened as early as the times of Bracton; and now no man is entitled to kill him wantonly, and in so doing he is guilty of murder. Outlawry in civil proceeding was formally abolished in 1879, and even in criminal cases it is but little used now in Britain. In an indictment for treason or felony an outlawry of the party indicated is equivalent to a conviction. Any one may arrest a person outlawed on such an indictment, either of his own motion or upon a warrant called a *capias utlagatum*, for the purpose of bringing him to execution. In other cases the effect of outlawry is the forfeiture of the goods of the outlaw to the crown, in which they become vested for the benefit of the plaintiff in the suit in which the outlawry is had. Another consequence of outlawry is, that the outlaw cannot bring any suit or process in his own name; he is, in this respect, deprived of the benefit of the law, and is consequently stripped of all his civil rights. The object of these severe penalties is to compel persons sued in civil process or indicted to appear and answer, instead of absconding and leaving the kingdom. The law is careful that so heavy penalties should not be incurred without sufficient grounds, and the most exact and formal proceedings. It is accordingly provided by Magna Charta that none shall be outlawed otherwise than according to the laws of the land. The ordinary proceeding for this purpose is to issue three writs successively to arrest the defendant. If he is not to be found the coroner is ordered by writ to exact or demand him in five

county courts successively, and the sheriff is ordered to make proclamation three times in the most public places in the county of his residence, calling upon him to appear and answer to the suit or indictment. If he does not thereupon appear a judgment of outlawry is passed. If, however, there is any, the least, defect in the proceedings, this judgment may be reversed on error.

OUTLINE, or CONTOUR, in drawing, is the representation of an imaginary line circumscribing the boundary of the visible superficies of objects, without indicating by shade or light the elevations and depressions, and without colour. Only one indication of light and shade is used in outlines—the greater lightness or darkness of the lines—and a skilful artist can produce much effect with these scanty means. The study of contour or outline is of the greatest importance to the painter; it is to him what the fundamental bass is to the musician. In recent times great attention has been paid to outline, and many engravings have been published representing only the outlines of celebrated works of art, or original compositions in outlines, by celebrated artists, such as Cornelius. In painting the outlines may be sharp, as in the ancient German school, or more soft and less defined, as in the Italian school.

OUTPOST, in military language, a post or station beyond the limits of the camp, or at a distance from the main body of the army. The term is also applied to the body of men placed at this station. Outposts are sent out for the purpose of watching the approach of an enemy, and of keeping him off until the main force is prepared to receive him. It is the duty of the officer commanding an outpost to use all the means that circumstances put in his power to keep the enemy at point-blank range, by felling trees, blocking up paths, breaking up the ground, &c. He must carefully note all the heights within range, the passages by which an enemy could approach, and the woods, buildings, &c., in which he could find cover.

OUTRAM, LIEUTENANT-GENERAL SIR JAMES, the son of Benjamin Outram, a civil engineer, and Margaret, daughter of Dr. Anderson, of Mounie, Aberdeenshire, was born at Butterley Hall, Derbyshire, 29th January, 1803. He was left an orphan at the age of two years, and was educated first under Dr. Bisset, at Udny, Aberdeenshire, and afterwards at Marischal College, Aberdeen, where he distinguished himself. In 1819 he went out as a cadet to India, and after commanding for some time a body of irregular troops, was appointed adjutant to the 23d Regiment of Bombay Native Infantry. In 1828 he was selected to undertake a mission to the ferocious Bheel tribes, whom he first beat in battle, and then disciplined them into a military force, with which he conquered the Daung tribes. From 1835 to 1838 he was employed in subduing the rebel chief of the Mahi-Kânta. In the last-mentioned year, as adjutant to Lord Keane, he took part in the Afghan war, and distinguished himself at the capture of Khelat, and by his dangerous ride disguised as a native devotee through the enemy's country to Kurrachee (1840). After the capture of Ghuznee, in which he assisted, he discharged in succession the functions of political agent at Gujerat, those of commissary in Upper Sind, besides undertaking the duties of British resident at Hyderabad, Sattara, and Lucknow. In all these capacities he displayed military talents of a high order, as well as admirable administrative qualities. In 1842 he was appointed commissioner to negotiate with the Ameers of Sind, in which position he adopted views at variance with the aggressive policy of General Sir Charles James Napier, and the consequence was an acrimonious correspondence between the two soldiers, carried on, however, by both in a spirit of good faith. Sir James had the satisfaction in the end of knowing that his views were confirmed by the directors. His opponent gracefully styled him publicly the Bayard of India. He showed his sincerity by handing over his share of the Sind prize-money to the Bombay public charities. In 1843 he visited England, and in the following year he was appointed to a command in the Mahratta country. He was appointed resident at Baroda in 1847. While filling a responsible post at Bombay some time afterwards he unhesitatingly exposed the official venality then prevalent, and though met with violent opposition, was in the end successful in bringing about a better state of matters. In 1856 he was nominated successor to Sir John Lawrence as chief commissioner of Oude. After another short visit to England Outram was sent out at the head of the expeditionary force against Persia. He landed at Bushire, 30th January, 1857, and by a series of brilliant victories brought the war to a satisfactory conclusion in three months. On his return to Bombay he found his services urgently needed to suppress the mutiny. (See INDIAN MUTINY.) The governor-general appointed him commander of the Dinapur and Cawnpur division, at a time when Havelock was heroically struggling against almost overwhelming difficulties. Outram, accompanied by Sir Colin Campbell, reached Dinapur on the 18th August, Allahabad 1st September, and Cawnpur on the 15th. Although of higher rank than Havelock, he generously waived his right, leaving the command to one who had proved he so well deserved it, and fought under Havelock until Lucknow was relieved. The relief was effected on the 25th, but Outram and Havelock were cooped up within the city for two months longer. On the defeat of the besiegers by Sir Colin Campbell the residency was evacuated by the British, who succeeded in bringing away all their women and children on the 23d November. On the following March Outram commanded the first division of infantry when Campbell finally regained possession of Lucknow. His services were rewarded with a baronetcy, the rank of lieutenant-general, the order of the grand-cross of the Bath, and the thanks of Parliament. He was compelled by the shattered state of his health to return to England, where he was received with due honour. He was one of the original members of the order of the Star of India, and was pressed to become one of the Home Indian Council, but his health was too far gone for any more work, and up till the time of his death at Pau, 11th March, 1863, he resided almost continuously in France. He was buried in Westminster Abbey on the 25th. In 1871 a bronze statue of Outram was erected in the gardens of the Thames Embankment.

OUTRIGGER, a strong beam of timber, of which there are several, fixed on the side of a ship, and projecting from it, in order to secure the masts in the act of careening, by counteracting the strain they suffer from the effort of the careening tackles, which, being applied to the mast-head, draw it downwards, so as to act upon the vessel with the power of a lever, whose fulcrum is in her centre of gravity. *Outrigger* is also a small boom, occasionally used in the tops, to give additional security to the top-mast. The term is also improperly applied to an iron bracket fixed in the side of a boat, with the rowlock at the bracket's extremity; this gives an increased leverage to the oar, without widening the boat.

OUTWORKS are all works of a fortress which are situated without the principal wall, within or beyond the principal ditch. All outworks must be so constructed—1, that the enemy must attack them before he can reach the principal wall; 2, that they give lateral defence to the principal wall; 3, that

they completely cover all parts of the principal wall from the enemy's batteries erected beyond the glacis; 4, that they shall be conspicuous from the principal wall. See FORTIFICATION.

OUZEL. This genus of Insessorial or Perching Birds is typically included in the family of the Turdinæ, or true Thrushes, the Water Ouzel being included within a nearly allied but different family, that of the Formicarinæ, or Ant-thrushes. The Common or Ring Ouzel (*Turdus torquatus*) is a summer visitant of Britain. The bill is of moderate length, of stout and compressed shape, and the upper mandible slightly notched near its tip. The nostrils are placed at the base of the beak, and the gape is provided with bristles. The outer toe is the longest, and is united to the middle toe at its base, whilst all the toes possess sharp, curved claws. The plumage of the Ring Ouzel is of black colour, and its specific name is derived from the presence of a broad semilunar patch or stripe of white extending across its breast. The song is clear and pleasant, but presents no striking peculiarities. The Water Ouzel (*Cinclus aquaticus*), or 'Dipper,' as it is also called (see DIPPER), is an inhabitant of Britain, but the genus also possesses representatives in other quarters of the globe. These foreign members nearly resemble the British form in habits.

OVAMPO, or OVAMBO, a people of South Africa, inhabiting a territory of which only a very narrow tract has yet been explored, but understood to lie between lat. 17° and 19° S.; lon. 12° and 17° E., and to be bounded north by the Cunene, west by the Atlantic, south by the Bushmen's country and Damara Land, and east by several independent tribes. Nangoro, the residence of the king or chief, is in lat. 18° S. and lon. 16° 25′ E. The Ovampo, apparently a connecting link between the negroes and Kaffirs, are of very dark complexion, tall and robust, and remarkably ugly. The hair is short, crisp, and woolly. The men often shave it off, leaving the crown untouched; but the women stiffen it with a kind of red paste, in the manner practised in many other parts of Africa. The principal female ornaments are heavy iron anklets, a profusion of cowries and other shells, and beads of every size and colour, so arranged as to hide a considerable part of the person. Their staple food is a kind of grain like Kaffir corn. The houses are of a circular form, with a circuit of 16 feet and a height not much exceeding 4 feet. These huts, arranged in groups, are inclosed by strong palisades, across which an intricate passage leads to the abodes of the master and his servants, open courts, granaries, byres, pig-sties, &c. The domestic animals thus accommodated are oxen, sheep, goats, pigs, dogs, and poultry. The arms consist of bows and arrows, a dagger, assegais, and knob-kerries. Though thus provided with weapons the Ovampo are peacefully disposed and industrious. In tilling the ground, which seems to contain an alternation of sand above and blue clay beneath, and to be on the whole very fertile, all, male and female, bear their part. The task of cleaning the growing crop, reaping it, and afterwards grinding the grain by means of a stout pole in a mortar or hollow wooden tube, falls chiefly on the women; the men being employed either in tending the cattle (of which they possess vast numbers) or in making trading excursions to the neighbouring tribes, with whom they exchange cattle, ostrich feathers, and ivory, for beads, iron, copper, shells, &c. Though neither iron nor copper is found in the country the Ovampo have the art of smelting the ores, and making some rude articles of hardware from the metals. They are hospitable, strictly honest, affectionate, humane, and have a strong love of their native soil. Polygamy prevails. The territory has been partially explored by Sir J. Alexander, Messrs. Galton, Andersson, and others.

OVAR, a town of Portugal, in the province of Douro, near the Atlantic, on the north shore of the Bay of Aveiro, 22 miles south of Oporto. It is well built, but is completely surrounded with sands, planted with sea-pine to prevent their encroachment; inhabitants occupied in fishing and trade. Pop. 10,000.

OVARY, or OVARIUM, the essential part of the female generative apparatus in which the ova or eggs are formed and developed. The ovary in the female corresponds to the *testis* of the male. In the lowest animals in which the process of sexual reproduction has been definitely ascertained to take place the ovarium is generally to be recognized. In the human female the *ovaries* exist as two bodies of somewhat oval shape, and compressed from side to side. They are situated one on each side of the *uterus* or womb, and are imbedded in the folds of the *broad ligament* of that organ. They are attached to the *fundus* or hinder portion of the body of the womb by two thin cord-like bands—the *ovarian ligaments*. Each ovary is about 1¼ inch in length, and about 1½ drachms in weight. In women who have not menstruated the external surface of the organ is smooth; whilst after menstruation, and for reasons to be presently explained, their surface becomes irregular, uneven, or scarred. A section of the ovary reveals a characteristic structure. Externally we find a fibrous layer or coat of fibro-cellular tissue, known as the *tunica albuginea*, this layer being covered in turn by peritoneum. Within the tunica albuginea the substance of the ovary is found to be made up of a fibrous tissue or *stroma* supplied with blood-vessels, and imbedded amid which a number of small *vesicles* of transparent character are to be observed. These vesicles, known as *ovisacs* or as *Graäfian follicles* or *vesicles*, are most numerous in the outer parts of the ovary. They number from eight or ten to thirty, the largest averaging a small pea in size. Each vesicle is composed of a thin wall containing a clear albuminous fluid. These Graäfian vesicles, or ovisacs, are the cells in which the ova or eggs are developed. If one be examined when mature—at which period the vesicles project slightly from the surface of the ovary—it is found to possess an outer fibro-vascular coat continuous with the stroma or general tissue of the ovary; and an inner layer or *ovi-capsule*, which is in turn lined by a layer of cells possessing nuclei, and collectively constituting the *membrana granulosa* or *granular* membrane of the ovum. Within this membrane a clear fluid is contained—the fluid of the Graäfian vesicle; and suspended amid this fluid, and immediately surrounded by a layer of granular cells—the *granular zone* or *discus proligerus*—we find the *ovum* itself. See OVUM.

With regard to the *functions* of the ovary, these are only assumed and become active on the approach of puberty (which see). At this period, along with the enlargement of the breasts and the other signs of approaching womanhood, the development of Graäfian vesicles with their contained ova begins to assume a high importance in the economy of the organ. And at the fitting period the vesicles, having arrived at the surface of the ovary, burst, and the ovum escapes from the ruptured sac in which it was developed, and passes down the *oviduct* or *Fallopian tube*, which becomes at this time adherent to the ovary. Through the Fallopian tube the ovum is thus conveyed into the uterus or womb. There the ovum meeting with the male element—if sexual union have taken place—becomes impregnated or fertilized, and the development of a new being is the result. This rupture and discharge of ova in the

human female, and also in the females of the higher mammals at least, is accompanied by a discharge of blood from the generative organs, which generally occurs at monthly periods, and which is known as *menstruation* (which see) or *catamenia*. This discharge of blood is not to be regarded as anything more than a mere symptom of the deeper and essential process of *ovulation*—that is, the discharge from the ovary of ova or eggs. In lower mammals the period of 'rut' corresponds to the menstrual periods in women, and sexual desire is usually greatest at such periods. The Graäfian vesicle becomes filled with blood after the discharge of the ovum; and afterwards the circumference of the vesicle is infiltrated by a yellow substance of firm consistency, which is derived from the part-absorption and alteration of the effused blood. This yellowish deposit, which occurs in every vesicle after the discharge of an ovum, is the *corpus luteum*. It remains for a longer or shorter period and then degenerates into cicatricial or fibrous tissue. Corpora lutea are termed *true* and *false* accordingly as the escaped ovum becomes fertilized or not. The true corpus luteum, or that of pregnancy, is large, rounded, and projects prominently from the surface of the ovary, and the growth of the yellow deposit continues during the period of gestation. The cavity of the true corpus luteum becomes puckered and stellate or star-shaped in form as pregnancy advances, and the bright yellow colour at the end of pregnancy disappears. The false corpus luteum, or that resulting from the discharge of an ovum which has not been impregnated, is of small size, and shows no projection from the ovarian surface. No cavity is contained within it, and the yellow colour is undecided or absent altogether. It gradually shrinks away, and at the end of six months has totally disappeared. The persistence of the *true* corpus luteum is thus a marked feature of that form of the structure; and the diagnosis of these conditions is of the highest importance in medico-legal investigations.

The ovaries are supplied with blood by the *ovarian arteries* derived from the aorta; and the nerves arise from the *spermatic* or *ovarian* plexus. These structures are subject to diseased conditions, chief among which are cancer and the occurrence of tumours and cysts containing fluid, the latter sometimes reaching an enormous size. The operation of *ovariotomy*, or that of removing such diseased growths, is now performed by surgeons with successful results.

OVATION. See TRIUMPH.

OVEN BIRDS, birds belonging to the sub-family Furnarinæ, included in the family Certhidæ or Creepers, which are classified in the Tenuirostral section of the Insessores or Perching Birds. The oven-birds are found in tropical America, and extend to the West Indies also. They are all of small size, and feed upon seeds, fruits, and insects. They walk on the ground with great ease. Some of these forms appear to frequent the shore, where they feed upon small molluscs and crabs. They are said to be exceedingly tame: one species—*Furnarius fuliginosus*—perching without fear on the hand of a stranger. The outer toe in these birds is slightly longer than the inner. Some of these birds are described by Darwin as being found floating at sea on the fronds of sea-weed. Their popular name is derived from the form of the nest which they construct. It is built of straws and dried leaves of various kinds, and resembles an oven in shape, being about 8 inches in diameter. The walls are about an inch thick. The aperture exists at the side, and the interior is divided by a partition-wall into two rooms, in the inner of which the eggs are deposited. The nest is placed on a high and generally exposed site.

OVERBECK, FRIEDRICH, a German painter, was born at Lübeck, 3d July, 1789. He commenced his artistic studies in Vienna in 1806, and in 1810 went to Rome, where he was soon afterwards joined by Cornelius and Schadow. The three young painters, animated with similar ideas, and profiting by the counsel of Friedrich Schlegel, founded a new school of art, which greatly influenced European taste for a considerable length of time. They had become convinced that a return to the truth and simplicity of the Italian artists prior to the Renaissance could alone effect a healthful regeneration of art. A Madonna painted in 1811 first brought Overbeck into notice in Rome, and he soon put himself at the head of his school by the frescoes of Joseph Sold into Captivity and the Seven Years of Famine, painted in the villa of General Bartoldy, the Prussian consul, in which the young Germans executed their first important works. Overbeck gradually restricted himself to works of an exclusively devotional character, which he endeavoured to imbue with the religio-mystic feeling of an earlier epoch in art. In 1814, in company with several of his artistic brethren, he abjured Lutheranism, and embraced the Roman Catholic faith. At first he was surrounded by a band of enthusiastic followers, such as Veit, Pforr, Schnorr, and others, but by degrees they began to die out, or went over to the more vigorous and romantic style, into which the new German school expanded, renouncing the limited range of subjects and the almost ascetic style of their master. From the time he went to Rome as a student he made it almost exclusively the place of his abode, and there he died, 13th Nov. 1869. Among his chief works are a series of five frescoes, representing subjects from Tasso's Gerusalemme liberata, executed in the villa Massimi in Rome, and the Miracle of the Roses of St. Francis, painted for the church of the Madonna degli Angioli, near Assisi. His oil-paintings do not rank so high as his frescoes, being dry and weak in colour. The picture which first gained him a European reputation was the Entry of Christ into Jerusalem, completed in 1824 for the Marienkirche at Lübeck. His master-piece is, perhaps, The Influence of Christianity on Art, preserved in the Städel Institute, at Frankfort-on-the-Main. As a designer in charcoal and chalk he enjoys a wide celebrity, many engravings of his Passion of our Lord, Forty Illustrations from the Gospels, being executed by several of the best German artists.

OVERBURY, SIR THOMAS, principally known by the tragic circumstance of his death, was descended from an ancient family in Gloucestershire. He was born in 1581, in Warwickshire, and in 1595 was entered a fellow-commoner of Queen's College, Oxford. After taking a degree he removed to the Middle Temple for the study of the law; but his inclination being more turned to polite literature, he preferred the chance of pushing his fortune at court. In 1604 he contracted an acquaintance with Robert Carr (more correctly Ker), the worthless favourite of James I. The ignorance and mean qualifications of this minion rendered the services of a man of parts and education, like Overbury, exceedingly welcome, and he repaid his services by procuring for him in 1608 the honour of knighthood, and the place of a Welsh judge for his father. The intimacy continued to be mutually advantageous until the favourite engaged in his amour with the Countess of Essex. Sir Thomas countenanced this gallantry in the first instance; but when that infamous woman had, by a series of disgraceful proceedings (but too much countenanced by the king himself), procured a divorce from her husband, he opposed the projected marriage between her and her gallant, by the strongest remon-

strances. This counsel Carr (then become Viscount Rochester) communicated to the lady, who immediately exercised her influence for the removal of her adversary. She offered Sir David Wood £1000 to assassinate Overbury, but this bribe he cautiously refused, as she could not assure him of a pardon. An attempt then was made to place him at a distance, by appointing him to a foreign mission; but, relying upon his ascendency with the favourite, which he exercised with considerable arrogance, he refused to accept it. On the ground of disobedience in declining the king's service he was immediately arrested, and committed a close prisoner to the Tower, in April, 1613, and all access of his friends was debarred. At length, fear of his resentment and disclosures, if released, induced Rochester and the countess (now become his wife) to cause infected viands to be administered, at various times, to the unhappy prisoner, who finally fell a sacrifice to a poisoned clyster, September 15, 1613. All these facts afterwards appeared in evidence, when the accomplices in the murder were tried, and Sir Gervase Elwes, the lieutenant of the Tower, a creature of Rochester's, with several others, were condemned and executed. Carr and his lady (then become Earl and Countess of Somerset) were also convicted and condemned, but to the disgrace of James, pardoned for no assignable cause that will not add to the ignominy of the proceeding. Sir Thomas Overbury wrote both in verse and in prose; his poem entitled the Wife, and a series of prose essays on Characters, have been much admired. A complete edition of his works, with a life by E. F. Rimbault, was published in London in 1856.

OVER DARWEN. See DARWEN.

OVERIJSSEL, or OVERYSSEL, a province of the Netherlands, bounded on the north by the provinces of Friesland and Drenthe, east by Prussia, south by the province of Gelderland, and west by Gelderland and the Zuider Zee; about 60 miles long from north-west to south-east by 27 miles broad; area, 1283 square miles. It is watered by the Ijssel, which separates it from Gelderland, and by the Vecht and its affluents. Except a strip of argillaceous soil along the Ijssel, presenting good arable and meadow land, the province mostly consists of sand and turf; and its chief products are horses, cattle that yield excellent butter, and sheep, though a little oats, wheat, barley, buckwheat, and rye is grown in sundry localities. Spinning by steam machinery, bleaching, dyeing, and the manufacture of calicoes, linen, and damask, boat-building, &c., are carried on. Chief towns, Zwolle, Deventer, Almelo, and Kampen, the first-mentioned being the capital. Pop. in 1882, 279,540.

OVERLAND ROUTE to India, the route taken by travellers with whom time is the most important consideration. The Peninsular and Oriental Steam Navigation Company are the most important conveyers of passengers between London and Bombay, Madras, or Calcutta, and they offer the following choice of routes:—*via* Dover, Calais, Paris, Lyons, the Mont Cenis Tunnel, Modena, to Brindisi, thence by steamer to Port Said, through the Suez Canal, and down the Red Sea to the destined Indian port; this is the shortest route. One almost equally short is from Marseilles or Trieste by steamer to Alexandria, and thence by rail to Suez. For travellers with heavy luggage the route *via* Southampton, Gibraltar, and Malta to Alexandria is very convenient, no shifting being necessary until the latter port is reached, after a voyage of about thirteen days. By the shortest of these routes Calcutta may be reached in about forty days, but at an expense of over £100. The sea route by steamer round the Cape of Good Hope is much more tedious, as it usually occupies about ninety-four days, but is far less expensive.

OVERSEERS, public officers appointed annually in every parish of England and Wales for the purpose of raising by rate on the inhabitants the sums necessary for the relief of the poor; providing a stock of hemp, flax, wool, thread, iron, and other necessary material for setting the poor to work; apprenticing poor children and setting to work the children of parents unable to maintain them; and providing work for all persons, married or single, having no means to maintain themselves, and who use no ordinary and daily trade to get their living by. Not more than four and not less than two overseers must be appointed, and such appointment must take place on the 25th of March or within a fortnight thereafter. They are chosen by two or more justices of the peace from among the substantial resident householders paying the poor assessment, and are usually chosen from a list prepared by the parishioners assembled in vestry, but the justices are not bound to select from this list. Peers, members of Parliament, clergymen, Dissenting ministers, barristers, attorneys, doctors, military and naval officers, and others whose avocations require continual personal attendance are exempt from serving the office. All who are not exempted by some statute, and even women, are liable to be appointed, and it is an indictable misdemeanour to refuse without good cause to serve when duly appointed. The office is gratuitous, and no person is to be appointed overseer who is directly or indirectly concerned in any contract for the supply of any goods, materials, or provisions for the workhouse or for the relief of the poor of the parish or of the union comprising such parish. In granting relief to the poor overseers are entirely under the direction of the guardians, vestry, or other governing body; they have no discretionary power in granting relief except in extreme emergencies, and in no case in money. Besides the above duties overseers have numerous others not specially connected with the relief of the poor. They have to draw up the lists of all those entitled to vote for members of Parliament, of those qualified to serve as jurors and as parish constables, and if the parish is situated within a borough they must make out the burgess lists. They must appoint persons to enforce the vaccination acts; give the justices notice of all lunatics within the parish; must bury the dead bodies of persons cast on shore and of all paupers who die within the parish; they must protect the village greens from nuisance, and in general, where there is no local board of health, they must see to the carrying out of the Nuisances Removal Acts. In the larger parishes it is customary for the inhabitants in vestry assembled to appoint assistant overseers, salaried officials who relieve the annual overseers to some extent of their onerous duties. The assistant overseers have to find security for the proper discharge of their duties and for duly accounting for the sums of money passing through their hands.

OVERT, the same with *open*. Thus an overt act signifies an act which, in law, must be clearly proved, and such as is to be alleged in every indictment for high treason.

OVERTURE, in music, an introductory symphony, chiefly used to precede great musical compositions, as oratorios and operas, and intended to prepare the hearer for the following composition. But the Germans have even composed overtures for poetical works, as Beethoven's overture to Goethe's Egmont. Overtures are often played independently of the work for which they were written, as at the beginning of concerts; but their highest office is to convey to the intelligent lover of music the whole character of the following piece or to concentrate its chief musical ideas so as to give a sort of outline of it in instrumental music. The latter mode of composing overtures was first con-

ceived by the French, and such is the character of the overtures of their great composers, among whom may be classed Cherubini. Carl Maria von Weber, in the overtures to the Freischütz and Oberon, in which the general character of the following piece is given, has observed this rule, which did not exist when Mozart composed his admirable overtures to Figaro and Don Juan. In the oldest overtures the fugue was the chief part, preceded by a *grave* in $\frac{4}{4}$ time, not too much prolonged, and closing in the dominant. The *grave* was often repeated after the fugue. Another form came into vogue at a later period—three musical parts, in different movements—an *allegro*, an *andante*, and again an *allegro* or *presto*, were united. At present the most usual form is a brilliant and passionate *allegro*, preceded by a short, solemn passage. Gluck, in his overture to *Iphigenia in Aulis*, was the first who used this form.

OVIBOS. See Musk-ox.

OVID (Publius Ovidius Naso), one of the most celebrated Roman poets of the Augustan age, was of an equestrian though but moderately wealthy family, and was born at Sulmo, in the country of the Peligni, 20th March, 43 B.C. He and his elder brother Lucius were destined for the bar, and enjoyed a careful education. Ovid studied rhetoric under Aurelius Fuscus and Porcius Latro, and attained considerable skill in the art of declamation. But in spite of the exhortations of his father he devoted much of his time to the service of the Muses. On the death of his brother, at the age of twenty, the paternal opposition seems to have been mitigated; the property that would have been but scanty for two might amply suffice for one. He went, in order to complete his education, to Athens, where he gained a thorough knowledge of the Greek language. He afterwards travelled in Asia and Sicily in company with the poet Macer, one of his own relations. From what he says of his weak constitution, his easy and unambitious nature, it may be inferred that Ovid, after his return to Rome, never prosecuted the legal profession with energy, if indeed at all. He never entered the senate, although by birth entitled to that dignity. He became, however, successively one of the Triumviri capitales, of the Centumviri, and of the Decemviri. The duties of these offices sat lightly upon the shoulders of Ovid, who was devoted to the pleasures of a licentious life. He married twice in early life at the wish of his parents, but speedily divorced each of his wives. To a poet a mistress was in those days indispensable. Ovid's chief mistress in the early period of his life was the one whom he celebrated under the name of Corinna, who, if we are to believe Sidonius Apollinaris, was no less a personage than Julia, the accomplished but abandoned daughter of Augustus. His intrigues with this lady seem to have continued up till about his thirtieth year, when he married his third wife, whom he appears to have sincerely loved, and by whom he had a daughter, named Perilla. Till his fiftieth year Ovid continued to reside at Rome, at his house near the Capitol, paying an occasional visit to his Pelignian farm, and enjoying not only the friendship of a large circle of distinguished men but also the favour and esteem of the emperor and his family. By an edict of Augustus, however (A.D. 8), he was commanded to leave Rome for Tomi, a town on the inhospitable shores of the Black Sea, near the mouths of the Danube, the habitation of the rude Getæ, and the extreme limit of the empire. The sentence did not amount to an exsilium, but to a relegation, that is, he was not deprived of his rights of citizenship or of all hope of return. It is impossible now to come to any certain conclusion as to the cause of this banishment, that given in the edict—the publication of the Art of Love—being merely a pretext, the poem having been in circulation ten years previously. According to some the real cause was his intrigue with Julia, but she was exiled seven years before; the fact that her daughter, the younger Julia, was exiled at the same time as the poet leads us to infer that his fate had some connection with hers; but as Ovid says his fault was an involuntary one, and as the great disparity of years between the two rendered an intrigue improbable, it has been supposed that he must have become acquainted too well with the shameful licentiousness of the emperor and his family, and had therefore become obnoxious. The change from the luxurious life of a Roman gallant and boon companion to that of a friendless exile among barbarians whose very language was unknown to him must have been far from agreeable; the severity of the climate and the danger arising from incursions of plundering hordes, who rode up to the very walls of Tomi, must have increased the misery of the sensitive and indolent poet; and we find him addressing humble entreaties to the imperial court to shorten the term or change the place of banishment. These entreaties, backed up by those of his friends in Rome, were, however, of no avail. Ovid sought some relief in the midst of his misfortune by the exercise of his poetical talents. He also learned the language of the Tomitæ, and composed in it some poems in honour of Augustus, which were received with tumultuous applause when he recited them to the people. He soon became very popular with his new fellow-citizens, who honoured him with a decree exempting him from all public burdens. He died at Tomi in the year 18 A.D. The following is a list of the works that have come down to us either in whole or in part in the order in which they appeared:—1. Amorum Libri III., a revised and abridged edition, the first having appeared in five books. 2. Epistolæ Heroïdum, twenty-one in number. 3. Ars Amatoria, or De Arte Amandi (The Art of Love), written about 2 B.C., and ejected from the public libraries by command of Augustus at the time of the author's banishment. 4. Remedia Amoris. 5. Nux, the complaint of a nut-tree against the ill-treatment it receives from passers-by and even its own master. 6. Metamorphoseon Libri XV., the most deservedly popular of the poet's works, written when he was between the age of forty and fifty. It consists of a series of narratives of all the transformations recorded in legend from the beginning of time till the death of Julius Cæsar, whose change into a star is the last of the series. These narratives are treated as episodes, but connected into a harmonious whole with much skill. 7. Fastorum Libri XII., of which only the first six are extant. It is a sort of Roman poetic calendar, in which some tale from mythology or history is allotted to its appropriate day. 8. Tristium Libri V. 9. Epistolarum ex Ponto Libri IV., both consisting of elegiac poems, in which the exile mourns his unhappy lot and supplicates for his recall. 10. Ibis, a short satire against some traducer of the author's. Some other smaller poems are attributed to him. But many really authentic pieces have been lost; among others his tragedy Medea. Among the best editions of the entire works of Ovid, and of some particular poems, is that of Nicholas Heinsius (Amsterdam, 1658–61, three vols. 12mo), improved and accompanied with notes by Burmann (1727, Amsterdam, four vols. 4to). From this, with the notes of Heinsius, and an excellent verbal index, Fischer published a new edition (Leipzig, 1758 and 1773, four vols.) Mitscherlich published an edition of the complete works from the text of Burmann (Gottingen, 1796–98, two vols.) Among the more recent editions of value is that of Merkel (Leipzig, 1850–52). A good English translation of the Metamorphoses is that edited by Garth, assisted by Dryden, Addison, Congreve, and others.

OVIDUCT, the efferent duct of the ovarium or ovary (which see), through which the ova or eggs therein produced escape into the genital passages or into the external world, with a view to their impregnation or final discharge from the body. In mammals the oviducts are termed *Fallopian tubes*, being so named after the anatomist who described them. The oviducts in Invertebrata, as seen, for example, in molluscs, insects, &c., generally lead from the body to the external medium; impregnation being sometimes effected, as in bees, &c., whilst the eggs are passing through the duct. In the higher mammals the oviducts by their union and enlargement at their lower extremities form a cavity —the *uterus* or *womb* —the Fallopian tubes themselves opening into the uterus at its upper portion.

The ova or eggs from the ovum of mammals escape from the ovary at stated periods (see OVARY), and pass into the mouth of the Fallopian tube or oviduct, which at such times is closely applied to the surface of the ovary. The ovum passes along the tube to the womb, within which if fecundated it undergoes its further development.

OVIEDO, a town of Spain, in the Asturias, capital of a province of same name, 230 miles north-west of Madrid. It is walled, and has clean but very irregular streets and small squares; several churches, some of them the earliest in the Peninsula; a university, and various other educational establishments; a stately court-house, and magnificent hospital. The manufactures are hats, arms, napery, &c. In 1809 Oviedo was given up to pillage for three days by Ney. Pop. 34,460.—The province, area 4080 square miles; pop. 576,352, is situated on the Bay of Biscay, and bounded by the provinces of Santander, Leon, and Lugo. It has a wild and stormy coast, and a mountainous interior better adapted for pasture than agriculture. Great numbers of cattle, goats, and swine are raised; linens, woollens, leather, &c., are manufactured, and coal is exported.

OVIEDO Y VALDEZ, GONZALO FERNANDEZ DE, a Spanish historian, was born at Madrid in 1478. He was a page at the court of Ferdinand and Isabella, and afterwards served in the army, distinguishing himself at the siege of Granada and in the Neapolitan war. In 1513 he received a government appointment in the newly-discovered Island of Hispaniola, and with few intervals spent the rest of his life there. As governor of the mines in the island his conduct formed no exception to that of his cruel and rapacious countrymen, and many Indians perished under his barbarous treatment. Named by Charles V. historiographer of the Indies, he wrote his Sumario de la Historia General y Natural de las Indias Occidentales, the first twenty books of which were published in 1535; the complete work in fifty books did not appear until 1783. The work for which he is chiefly celebrated is his Quinquagenas, so entitled from its consisting of fifty dialogues, in which the author is the chief interlocutor. This work contains a full notice of the principal persons in Spain, their lineage, revenues, arms, &c., with an inexhaustible fund of private anecdote. Oviedo died at Valladolid in 1557.

OVIPAROUS, a term applied to those animals which produce ova or eggs from which the young are afterwards hatched, either by the heat of the parent's body—as in birds—or independently of the parent's care altogether. Impregnation or fertilization of the eggs may take place either before or after they escape from the body of the female. Where the eggs—as in some lizards, some snakes, or as in the Land Salamanders—are retained within the body of the parent until such time as the young escape from them, the animals are said to be *ovo-viviparous*. The egg of the mammal, however, being not only produced and contained within the parent-body, but the young animal also undergoing its development therein, and being extruded therefrom at birth, presents a very different state of matters to the preceding cases. The Mammalia are therefore typically *viviparous* animals, that is, bringing forth the young alive.

OVIPOSITOR, the filament or process attached to the abdominal segments of certain insects, and used for placing the eggs in situations favourable to their due development. The ovipositor may possess a saw-like structure, as in the Cicadas, or may be sword-like, as in the Grasshoppers. The Gall-flies, by means of their ovipositors, puncture the tissues of plants, and deposit their eggs within the slit thus formed—this process setting up a diseased or irritating condition within the plant, which results in the formation of the well-known 'gall.' The Ichneumons and Cuckoo-flies possess very long ovipositors, with which they wound the bodies of other insects, and therein deposit their eggs. The *aculeus* or 'sting' of bees, wasps, &c., is a modification of an ovipositor or analogous structure. See ENTOMOLOGY.

OVO-VIVIPAROUS. See OVIPAROUS.

OVUM, the 'egg' or essential product of the female reproductive system, which, after impregnation by contact with the semen or essential fluid of the male, is capable of developing into a new and independent being. It seems clear that even the lowest animals, the Protozoa, produce bodies which assume the functions and exhibit the characteristics of ova. And from the Protozoa upwards every group of the animal kingdom produces ova, differing slightly, it may be, in structural details, but presenting certain essential and common features also. The ovum is to the animal body what the seed is to the plant. Both require fertilization—in the case of the animal, by the male seminal fluid; in the case of the plant, by the pollen. The ovum is therefore concerned in *true* or *sexual* reproduction, since the production and impregnation of ova necessitate the presence of the distinct sexes, male and female. All other modes of reproduction, in which ova are absent, or in which no sexual congress or fertilization takes place, are termed *asexual* modes. Such are the processes of *fission* or division of the body-substance, and of gemmation or budding, seen in many animal forms. In some cases—which will be treated of under the head of REPRODUCTION—ova, or bodies resembling ova, are known to develop into new beings without the presence of the male element.

The essential parts to be recognized in the structure of every true ovum or egg consist, firstly, of an outer membrane like the cell-wall, and known as the *zona pellucida* or *vitelline membrane*. Within this is contained the *vitellus* or *yolk*, and imbedded in the yolk-mass the *germinal vesicle* and smaller *germinal spot* are seen. These essential parts are present in all ova, and the differences between the ova of different animals have reference chiefly to the disposition and arrangement of the coverings of the ovum, and to the relative preponderance of its various parts. As described in the article OVARY, the ovum of Mammalia, for example, lies within its developing *ovisac* or *Graäfian vesicle*, from which it subsequently escapes, and in which it is surrounded by certain coverings. See REPRODUCTION, GENERATION, &c.

OWEN, JOHN, D.D., an English Nonconformist divine, was born at Stadham in Oxfordshire in 1616, of which place his father was vicar. He studied at Oxford, and remained at college until his twenty-first year. On the breaking out of the civil war he took part with the Parliament, became a tutor in the

family of Sir Robert Dormer, and chaplain to Lord Lovelace, but subsequently repaired to London, where he wrote his Display of Arminianism, which was published in 1642. He had hitherto been a Presbyterian in matters of church government, but now adopted the Independent mode. During the siege of Colchester he became acquainted with General Fairfax, and was appointed to preach at Whitehall the day after the execution of Charles I. He was soon after introduced to Cromwell, whom he accompanied in his expeditions both to Ireland and Scotland, and in 1651 was made Dean of Christ Church College, Oxford, and in 1652 was nominated by Cromwell, then chancellor of the university, his vice-chancellor. A coldness appears, however, to have sprung up between him and the Protector, for he was deprived of that office and his deanery in 1657. At the meeting of his brethren at the Savoy in 1658 he took part in drawing up the Confession of Faith of the Congregational churches. He died in 1683. Among Owen's works, which are of a high Calvinistic character, may be mentioned an Exposition on the Epistle to the Hebrews; a Discourse on the Holy Spirit; an Inquiry into the Original Nature, Institution, &c., of Evangelical Churches; an Account of the Nature of the Protestant Religion, &c.

OWEN, Robert, the celebrated social theorist, was born of humble parentage at Newton in Montgomeryshire, North Wales, in 1771. At the age of fourteen he obtained a situation in a mercantile office in London, and there so distinguished himself by his business talents that at eighteen he became manager of a spinning-mill at Chorlton, near Manchester. He next became manager of the New Lanark cotton mills, belonging to Mr. Dale, a wealthy Glasgow manufacturer, whose daughter he married. In 1814 the mills were sold, and purchased by a new company, with Mr. Owen as principal acting partner. This copartnery included the names of William Allen, Joseph Fox, Jeremy Bentham, and other noted philanthropists and reformers, and was organized on the principle 'that all profits beyond 5 per cent per annum on the capital invested shall be laid aside for the religious, educational, and moral improvement of the workers and of the community at large.' Provision was also made for the religious education of the children of the operatives, the irreligious principles of Owen having not yet been publicly avowed. These, however, were not long in making their appearance. In 1812 he published New Views of Society, or Essays upon the Formation of Human Character; and subsequently a Book of the New Moral World, in which he completely developed his socialistic views, insisting upon an absolute equality among men. In the dissemination of these doctrines he visited the principal towns of Great Britain and America, where he was received with considerable favour. His connection with the New Lanark mills ceased in 1827. He had three opportunities of setting up social communities on his own plan—one at Romney in America, another at Orbiston in Lanarkshire, and the last, in 1844, at Harmony Hall in Hampshire. They proved signal failures, their originator attributing their non-success to their not being sufficiently carried out on his principles. In his later years Mr. Owen became a votary of spirit-rapping and kindred delusions. His last public appearance was at the Social Science Congress at Liverpool in the autumn of 1858. He spoke for a few minutes, but his strength failing him he was removed to his hotel, and after remaining there a few days set out for his native town of Newton, where he expired on 17th November. His eldest son, Robert Dale Owen (1801–1877), was for a time resident minister of the United States at Naples; and another son, David Dale Owen (1807–1860), acquired reputation as a geologist.

OWENS COLLEGE, The, Manchester, an institution established under the will of John Owens, a Manchester merchant, who died July, 1846, and left about £100,000 for the purpose of founding an institution for providing or aiding the means of instructing and improving youths, not less than fourteen years of age, in such branches of learning and science as are now or may be hereafter taught in the English universities, subject to the immutable condition that no student, professor, &c., shall be required to make any declaration or submit to any test of their religious opinions, and that theological and religious subjects shall form no part of the teaching of the college. The bequest having been given to found the college and not to provide buildings for it, the institution occupied from 1851 to 1873 a large house in which Cobden formerly resided; but in 1867 it was resolved to appeal to the public for funds for the erection of a new building, and for the extension of the curriculum. The appeal was heartily responded to, and a handsome Gothic building was constructed, which has since been the home of the college. The increasing success of the college led to a project for a university charter. After considerable opposition a scheme was proposed that a university should be incorporated, which should consist of several affiliated colleges located in different towns, but having its seat in Manchester. Accordingly in 1880 Victoria University was instituted by royal charter, with power to grant degrees in arts, science, and law, a supplemental charter, granted May, 1883, giving power to grant degrees in medicine. Owens College is as yet the only constituted college in the university. The chemical laboratory is considered the finest in the kingdom; the library includes a valuable collection left by Dr. Lee, bishop of Manchester, and numbers 35,000 vols. A large medical school has been built behind the college, and is supplied with the latest and most complete appliances, and extensive medical, anatomical, and pathological museums and libraries. Additional buildings in connection with the college for the natural science department, including botanical, zoological, and geological museums and offices, are in course of erection. The Manchester Royal School of Medicine has been affiliated with the college. The students of the session 1882–83 numbered 1340. A women's college, which had been for some time under the direction of the professors of Owens College, has now been taken over by the authorities of the college. The classes are held in separate buildings in Brunswick Street in the vicinity, but the lectures and examination papers are identically the same as those for the classes conducted within the college walls. The charter of Victoria University gives power to grant degrees to women, and the examinations are thrown open to them.

OWHYHEE. See Sandwich Islands.

OWL, a group of birds forming a well-defined family (Strigidæ), which in itself represents the Nocturnal Section of the order of Raptores or Birds of Prey. The head is large and covered with feathers, which are generally arranged around the eyes in circular discs, and in some species form horn-like tufts on the upper surface of the head. The beak is short, strongly curved, and hooked. It is encircled at its base by feathers and by bristles, the nostrils opening in a 'cere' near the base of the beak. The ears are generally of large size, prominent, and in many cases provided with a kind of fleshy valve or lid. The eyes are also very prominent and full. They project forwards, the pupils of the eyes being especially well developed—a structure enabling them to

see well at dusk or in the dark, but unfitted for the bright glare of daylight. The plumage is also of soft downy character—a conformation enabling these birds to fly without making noise or rustling, and along with other characters fitting them for pre-eminently nocturnal existence and habits. The wings are of moderate size, and these birds do not generally possess very marked powers of flight. The legs are short, but stoutly made, and the toes are armed with very strong curved nails. The tarsi are feathered, generally to the very base of the claws, the feathers of the feet generally wanting barbs, so that the fibres of their webs are unconnected, and appear in the form of hairs. The toes, like those of other Raptores, are arranged three forwards and one backwards; but in the owls the outer toe can be turned backwards at will, and the feet are thus converted into hand-like or prehensile organs, resembling the arrangement in the Scansorial or Climbing Birds. The sense of hearing is exceedingly acute in the Owls, the ear being protected by valvular processes. In habits most, although not all, are nocturnal, flying swiftly and noiselessly about during the night, and preying upon the smaller quadrupeds, such as mice, upon bats, upon nocturnal insects such as moths, and upon the smaller birds. Some of them catch fishes with dexterity. The prey, if small, is swallowed entire; larger quarry is torn and devoured, the feathers or indigestible portions of the prey being afterwards rejected. No crop exists, the gullet being of very wide conformation. The intestine, as in most flesh-eaters, is short, and the cæca or blind sacs attached at the commencement of the larger intestine, are of large size in these birds. During the day the owls inhabit the crevices of rocks, the nooks and crannies of old or ruined buildings, or the hollows of trees; and in these situations the nests are constructed. They are solitary in habits, and the female lays from two to six eggs. In their distribution the owls occur very generally over the habitable globe, both worlds possessing typical representatives of the group. The typical genus is that of the *Strix*, but the family includes several other genera, all of which represent peculiarities more or less marked in conformation or appearance.

The subdivision of the Striginæ or True Owls, in which the head is smooth and does not possess horn-like tufts, and in which the discs of facial feathers are complete, includes the Common White or Barn Owl (*Strix flammea*), found very generally distributed over the British Islands. These birds chiefly subsist upon the mice of barns and stackyards. It is known as the Screech Owl from its loud note. It is said to capture fish by suddenly pouncing upon them in the water. It averages between 13 and 14 inches in length, and possesses a stretch of wing extending about 3 feet. It builds no formal or definite nest, depositing the eggs in holes and in like situations. The eggs number from two to six, and are of a white colour. The breeding season extends between July and December of the same year, and the young of two or three different broods appear to inhabit the nest at the same time. This owl is also found throughout Europe, in Tartary, Persia, India, at the Cape of Good Hope, and in America. The *Pholidius badius*, or Wowo-wiwi of Java, is an Asiatic representative of the Strigidæ. The *Otinæ*, or Owlets, possess nearly complete feathered discs around the eyes, and two small feathered tufts on the upper aspect of the head. These owls are as universally distributed as the Strigidæ. The family includes the Short-eared Owl (*Otus brachyotus*), a familiar British form which also occurs in India. The Long-eared Owl (*O. vulgaris*) is another common English species, which appears to reside permanently in Britain. The Hooting Owls, without tufts, are represented by the Tawny or Brown Owl (*Syrnium* or *Ulula Stridula*), which is an inhabitant of British woods, and which is represented in North America by the *S. Tengmalmi*, a species occasionally met with in Britain. The Tawny Owl is coloured ashen-gray, variegated with brown on the upper parts, and a whitish-gray with various tints of brown on the under parts. The facial discs are nearly white, edged with brown, and the feet are feathered to the claws. Its nest is built in holes of trees, and in general it frequents the depths of woods and forests. Its food is very miscellaneous; young rabbits, hares, birds, reptiles, insects, and even fish forming part of its dietary, besides mice. It is a very bold bird, especially when it has young, and has been known to kill and devour young magpies, in spite of the resistance of the old birds. (Pl. CXLIV.–CXLV. fig. 15.)

The *Bubonina*, or Horned Owls, are distinguished by the incomplete facial discs, by the broad head, and by the elongated horn-like tufts. These birds are plentifully distributed over the world, but attain their largest size in warm countries. The Eagle Owl (*Bubo maximus;* fig. 14) is rare in Britain, but occurs in Norway, Sweden, and Lapland, and over the continent of Europe, to the Mediterranean Sea. It is also found in Asia. The nest is large, and is built on the ground, the female laying two or three eggs of a white colour. From the great bulk of its plumage it seems to rival the Golden Eagle in size, but it is really not more than one-fourth of the weight of that bird. Its prey consists of grouse, partridges, hares, and other game, and even lambs and young deer. The Eagle Owl is a very courageous bird, and has been known to fight with and beat off the Golden Eagle. Length, rather more than 2 feet; extent of wings, 5. The colour of the upper surface is brown, with a tinge of yellow marked with bars, streaks, and dashes of blackish brown; the under surface is nearly yellow, with black streaks and bars of brown. The Great American Horned Owl (*B. Virginianus*) inhabits the southern portions of the United States. It is smaller than the Eagle Owl. The Little Horned Owl of Europe (*Scops Aldrovandi*) is especially common on the Mediterranean borders of the European continent. It also occurs in Asia eastwards to India, and migrates to Africa in autumn. It averages 6 or 7 inches in length, and feeds upon mice and insects of various kinds. The *Ketupa flavipes* of India is a diurnal owl and an expert fisher. The *K. Ceyloniensis* is also a familiar species of this group, and the *Bubo Bengalensis* of India is said to feed chiefly upon rats, which it captures with great dexterity.

The Hawk Owls, or *Surninæ*, resemble the Eagles and other diurnal birds of prey more closely than do the foregoing families of owls. The facial discs are incomplete. The head is of small size, and 'horns' are wanting. The eyes are of smaller size than in other owls, and the external ear is also of more limited extent. These birds mostly inhabit the Arctic regions, but migrate southwards in winter. The Snowy Owl (*Surnia nictea*) is a familiar member of this group. It occurs in the Shetland Islands, and is a bird of large size. Its plumage is of thick character, adapting it for its northern residence. Its powers of flight are great. It feeds on birds, rabbits, hares, and lemmings, and is also an expert fisher. Its colour is white, more or less spotted and barred with dusky patches; feet densely clothed with long feathers; bill black; eyes large and orange-coloured; length from 22 to 27 inches.

The owls of the genus *Athene*, included in the subfamily Surninæ, inhabit the warmer regions of the world, although one species (*A. passerina*), the smallest of the group, occurs in Britain. It flies abroad during

the day. It measures only 7 inches in length, and 14 inches in extent of wings. The *A. scutulata* inhabits India, and like other members of the genus emits peculiar shrill cries. The food consists chiefly of insects. The Burrowing Owl (*A. cunicularia*) of America and the West Indies is notable as inhabiting the burrows of the Marmots (which see), or Prairie-dogs—the owls possessing themselves of these burrows and breeding therein, much to the discomfort of the original possessors of the abodes. These birds are diurnal in habits; their food consists of mice and insects.

OWLGLASS, or HOWLEGLASS. See EULENSPIEGEL.

OX. Under this name are included the typical members of the family Bovidæ, a group included in the section of the Ruminant Hoofed Quadrupeds (Ungulata). The ruminant group itself is divided into various subdivisions, and in one of these subdivisions—that of the Cavicornia or 'Hollow-horned' Ruminantia—the oxen family is contained. As implied by the name Cavicornia, the horns consist each of 'a horn-core' or process of the frontal bone of the skull, which is invested by a horny sheath; and unlike the horns of the deer, those of the oxen and their allies are not deciduous, but persist and remain permanent throughout life. In the oxen the horns are of smooth, simple, and rounded conformation, not branched or twisted to form a spiral, as is seen in the antelopes, &c. They are usually curved upwards and outwards, in a lunate or somewhat lyre-shaped form. No 'lachrymal sinuses' or 'tearpits' exists. Several of the family are shown on Pl. CXCVIII.-CXCIX.

Of the oxen the Common Ox (*Bos taurus*) is the best known form, and exemplifies not only the degree of domestication which artificial breeding and selection may induce, but also the difficult nature of determining the exact or original progenitors of the numerous and different races or breeds which have sprung up through the perpetuation of breeding processes. Very wide differences are thus perceptible between the different races or breeds of cattle, which may reasonably be inferred to have sprung from common or nearly connected sources. The 'Chillingham Wild Cattle' (*Bos Scoticus*) have been credited with forming the small remnant or residue of the original stock from which the common ox and other breeds have been derived. By other naturalists these cattle are believed to be a distinct and original species, which is scientifically known under the designation given above. The Chillingham cattle possess a white body with a black muzzle. The horns are also white, and are coloured black at their tips. The Mountain Bull or *Bos Urus*, which ran wild in Gaul at the period of the Roman invasion, has been credited with being the progenitor of the Chillingham stock; whilst in another view the *Bos Urus* receives the credit of being also the progenitor of our domestic breeds. Other domestic breeds are probably descendants of the Short Horn of Britain (*Bos longifrons*), a species or race which has become extinct. The Aurochs or Lithuanian Bison (*Bos* or *Bonasus Bison*) forms another example of an original stock or species now nearly extinct. It is found in the Caucasus, Moldavia, and Walachia; and is preserved in the Lithuanian forests through the interest of the Emperor of Russia. This animal was the 'wild bull' or 'bison' of the ancients. It possesses a broad head with a convex forehead, covered with long wavy hair, which on the chin and breast forms a beard, and is continued to form a kind of rugged mane on the back. The eyes are large, prominent, and dark. The muzzle is projecting, and the fore part of the body is of thick humped conformation, and contrasts with the more slender hinder portion. The long hair appears to be shed annually in the summer. The tail is tufted, and is of moderate length. The females are of smaller size than the male animals. In disposition the aurochs is fierce and untractable; and this feature, together with its larger size and apparently marked specific characters, renders the probability of its having been an original progenitor of domestic breeds of cattle exceedingly doubtful. The American Bison (*Bison Americanus*), or American Buffalo, occurring in large herds in the North American prairies, is a near ally of the aurochs. It resembles the latter in general conformation and appearance, but is of larger size; possesses a much more massive head, a prominent hump between the shoulders, and a coarse shaggy mane. The horns are short, and curved downwards and upwards. The Common Buffalo (*Bubalis* or *Bos bubalis*) of India and Southern Asia possesses large horns, the bases of which are united on the forehead to form a large bony shield or plate. The same peculiarity distinguishes the African or Cape Buffalo (*B. Caffer*), of which more than one variety or species is known. The Zebu or Brahmin Bull of India (*Bos taurus*, variety *Indicus*) possesses a curious hump of fat at the back of the neck, rising above the withers, and arching the back, which falls towards the tail. A long 'dewlap' exists. This race or variety is found in China, Madagascar, and the East African coast; and representations on Egyptian monuments show that at a very early period these animals were bred and domesticated. The allied 'Yak' (*Bos* or *Poëphagus grunniens*), found in Thibet, resembles a small buffalo in appearance, the tail not being tufted but flowing like that of the horse. The hair of the lower part of the body forms a very thick fringe, which touches the ground. The body colour is black. These animals live in a wild state near the snow line, but are domesticated by interbreeding with native or tame cattle. The tails are used in India to brush away flies, and are known as 'chowries;' and the Turkish officers use them as standards or insignia. They are used by the Tartars as beasts of burden, and the hair forms material for the manufacture of several useful fabrics. The horns are short and rounded, of slender make, and are bent inwards and slightly upwards. Their voice consists of a kind of grunting noise, not at all resembling the familiar 'low' of ordinary cattle. Palæontology reveals that the aurochs existed in Europe in prehistoric times, this fact telling against any probable relations which it may have formed with existing domestic breeds. The remains of the *Bos Urus* occur in Post-Pliocene deposits, along with those of the mammoth, woolly rhinoceros, and other typical extinct forms. It became extinct about the twelfth century. The remains of the *Bos longifrons* occur only in recent or prehistoric deposits, and the remains of the bison or aurochs are also found in formations of a similar age. See BISON, BUFFALO, MUSK OX, &c.

OXALIC ACID. This acid occurs, combined sometimes with potassium or sodium, at other times with calcium, in many plants; and also in the animal body, especially in urine, in urinary deposits, and in calculi. Inasmuch as oxalic acid is the most highly oxidized of all the carbon compounds, with the exception of carbon dioxide, very many processes of oxidation of organic bodies produce this substance. Thus sugar, starch, cellulose, &c., yield oxalic acid when fused with caustic potash, or when treated with strong nitric acid. Saw-dust is very much used for producing the acid; the process is as follows: A solution of caustic potash and soda is made in the proportion of one equivalent of the former to two of the latter; this solution is evaporated until its gravity is 1·35; saw-dust is then added so as to form a thick paste,

which is heated in thin layers on iron plates, with constant stirring. After the temperature has been maintained at 200° for one or two hours the whole of the woody fibre is decomposed, and the mass is entirely soluble in water. After a further exposure to the same temperature until the mass is dry it is treated with water, whereby certain sodium and potassium salts are dissolved, while sodium oxalate remains insoluble. From this sodium oxalate the calcium salt is formed, and this again is decomposed by means of sulphuric acid, whereby free oxalic acid is obtained. From two parts of saw-dust about one part of oxalic acid is obtained. Oxalic acid has the formula $C_2H_2O_4$; it is a solid substance, which crystallizes in four-sided prisms, the sides of which are alternately broad and narrow, and the summits dihedral. They are efflorescent in dry air, but attract a little humidity if it be damp. They are soluble in one part of hot and two of cold water, and are decomposable by a red heat into carbon dioxide, carbon monoxide, and water, $C_2H_2O_4 = CO_2 + CO + H_2O$; their acidity is so great that, when dissolved in 3600 times their weight of water, the solution reddens litmus paper, and is perceptibly acid to the taste. Oxalic acid is a good test for detecting lime, which it separates from all the other acids, unless they are present in excess. It has likewise a greater affinity for lime than for any other of the bases, and forms with it a pulverulent, insoluble salt. With barium it forms an insoluble salt, but capable of dissolving in water acidulated with oxalic acid. Oxalate of magnesium, too, is insoluble unless the acid is in excess. Oxalate of potassium exists in two states, that of a neutral salt and that of a supersalt, and is used for the same purposes as oxalic acid. It is made by neutralizing a certain quantity of oxalic acid with carbonate of potash, and then adding as much more acid, or by extracting and crystallizing the juice from the leaves and stalks of the sorrel (*Oxalis acetosella*). Oxalate of ammonium is formed by neutralizing ammonia or its carbonate with oxalic acid, and is employed in the laboratory for detecting and determining lime. Oxalic acid is used chiefly as a discharging agent in certain styles of calico-printing, for whitening leather, as in boot-tops, and for removing ink and iron mould from wood and linen. It acts as a violent poison when swallowed in the quantity of 2 or 3 drachms; and several fatal accidents have occurred in consequence of its being sold by mistake for Epsom salts. The immediate rejection from the stomach of this acid by the stomach-pump, or an emetic, aided by copious draughts of warm water containing bicarbonate of potash, or soda, chalk, or carbonate of magnesia, are the remedies. Oxalic acid is dibasic, yielding salts whose general formulæ are $C_2H_2M_2O_4$ and $C_2H_2MHO_4$, where M equals a monovalent metal.

OXALIDACEÆ, a natural order of exogenous plants, comprising herbs, shrubs, and trees. The leaves are simple or compound, alternate, usually but not always without stipules, occasionally opposite; sepals five, sometimes slightly cohering at the base; petals five, with a twisted æstivation; stamens ten, in two rows, those opposite the petals being longer than those in the outer row; fruit capsular, membranous, or fleshy, usually five-celled; seeds few. They inhabit the hot as well as the temperate parts of the globe, and abound most in North America and at the Cape of Good Hope. The shrubby species are confined to the hotter latitudes. There are about six known genera and 325 species. They are often acid in their properties; some yield esculent roots. *Oxalis acetosella* (common wood-sorrel) receives its name from its acid taste. It contains binoxalate of potash, which is sometimes called salt of sorrel and sometimes the essential salt of lemons. The plant has been used as a refrigerant and antiscorbutic. Its leaves are trifoliate, and it has been by some considered to be the true shamrock, as it is in flower about that period of the year in which St. Patrick's Day falls. In some of the species an irritability of so marked a kind has been found as to cause them to be classed among sensitive plants. *Averrhoa Bilimbi* and *Oxalis sensitiva* are the most remarkable. *Oxalis crenata*, *esculenta*, and *Deppei* yield tubers which have been used as a substitute for potatoes. The fruit of the *Averrhoa Bilimbi* (Blimbing) and Carambola is used by the natives of the East Indies as food, but the acidity is intolerable to Europeans, who use them chiefly as pickles. Several species of Oxalis are used in Brazil against malignant fevers. The root of *Hugonia Mystax* smells like violets, and is said to be diuretic, diaphoretic, and anthelmintic.

OXENSTIERNA, Axel, Count, a Swedish statesman, born at Fånö in Upland in 1583. His own inclinations and the wishes of his family having destined him for the church, he applied himself at Rostock, Wittenberg, and Jena, principally to theology, for the study of which he always retained a predilection. After finishing his studies he visited most of the German courts, and in 1602 returned to Sweden. In 1606 Charles IX. sent him on a public mission to Mecklenburg, and in 1608 he was admitted into the senate, in which his thirteen immediate ancestors had held a seat. The infirmities of age having induced his sovereign not long after to appoint a regency, Oxenstierna was placed at the head of it, and on the accession of Gustavus Adolphus was made chancellor. In 1614 he accompanied the new king to Germany, and in 1617 had the satisfaction of seeing the hostilities between Sweden and Russia terminated by the honourable Peace of Stolbova. He was subsequently appointed governor-general of all the conquests of the Swedish arms in Germany; and when Gustavus penetrated into the heart of that country Oxenstierna was invested with full powers in all affairs, both civil and military, on the Rhine, and fixed his head-quarters at Mainz, while Gustavus advanced into Bavaria and Franconia. On the fall of his master at Lützen (1632) he exerted himself in every way to protect Sweden and her allies, and visited Dresden and Berlin to concert measures for continuing the war. The Swedish government conferred on him full powers to adopt any measures which he considered for the public good. He therefore assembled a congress at Heilbronn, in which he was recognized as the head of the Protestant League. This league was held together and supported solely by his influence and wisdom, and in 1636 he returned to Sweden after an absence of ten years, laid down his extraordinary powers, and took his seat in the senate as chancellor of the kingdom and one of the five guardians of the queen. His great aim was to bring the German war to a successful conclusion, and with this design he sent his son John to Germany in the capacity of Swedish plenipotentiary. In 1645 he assisted in the negotiations with Denmark at Bromsebro, and on his return was created count by Queen Christina, and at the same time was elected chancellor of the University of Upsal. When the queen declared her intention of naming her successor Oxenstierna opposed that measure with all his influence, and resisted with still stronger urgency her determination to abdicate the crown. Finding her, however, fixed in her resolution, he pretended sickness as an excuse for staying away and taking no part in a step which he foresaw would be the beginning of evil. From that time he took no pleasure in public affairs, although he continued to serve his country with zeal and ability until his death in 1654. Oxenstierna must be ranked among the greatest men

who have taken a distinguished part in the affairs of the European world. Great and elevated views, a wonderful political sagacity and foresight, firmness and loftiness of purpose, wisdom in contriving and prudence and energy in executing, a strict integrity, and a constant devotion to the welfare of his country, are among the characteristics of this great statesman. The constitution which was prepared by him, and accepted by the states of Sweden in 1634, is esteemed a political master-piece. His journal has been published.

OXFORD, or OXFORDSHIRE, an inland county in England, bounded north by the counties of Northampton and Warwick; west, Gloucester; south, Berks; east, Buckingham; area, 483,621 acres, of which in 1883, 417,509 acres were under crops, or in meadow and pasture. The south part of the county presents alternations of hill and dale, the former, particularly the Chiltern Hills, being beautifully varied with fine woods, tracts of arable land, and open sheep downs. The central parts are more level, but here also the scene is adorned by numerous woods. In the north and west the country presents a less pleasing aspect. The chalk-marl, green-sand, gault, iron-sand, oolite, Kimmeridge clay, and lias, appear at the surface in various parts of the county. Throughout a large portion of the county, and north-west from Oxford, the staple or surface soil is thin and light, rapid in its yield, and well adapted for the growth of green crops and barley. Towards Gloucester the land slopes gently south and west. Here grass-lands divide the soil with tillage, and hedgerow timber covers the face of the country as with a net-work. The corn-crops commonly cultivated are wheat (in 1883, 51,796 acres), barley (47,611 acres), of which great quantities of malt are made, and oats (31,771 acres); and the common turnip and swede are both extensively grown (together 34,618 acres). The grass-lands in the county being rich and extensive (the permanent pasture covering in 1883, 153,898 acres), dairy husbandry is largely practised, and great quantities of butter made. The live stock then included 13,716 agricultural horses, 50,209 cattle, 270,288 sheep, and 44,682 pigs. Manufactures are of little importance. The principal are the Witney blankets, Chipping Norton tweeds and cloth, Woodstock gloves, and a coarse kind of velvet called shag, made at Banbury. The principal rivers are the Thames or Isis, Thame, Evenlode, Cherwell, and Windrush. The county returns three members to Parliament. Pop. in 1871, 177,975; in 1881, 179,559.

OXFORD, a city in England, capital of the county of the same name, and seat of one of the most celebrated universities in the world, 52 miles W.N.W. London, on a gentle acclivity between the Cherwell and the Isis, which here unite and are crossed by several bridges, the principal of which are Magdalen Bridge over the Cherwell, and Folly Bridge over the Isis. In early times it was surrounded by walls, considerable portions of which still exist; and defended by a castle, of which the keep, built in the time of Rufus, remains entire, and is included in the precincts of the prison. The principal street, called High Street, has a total length of about 1000 yards, and a width where greatest of 85 feet, is adorned by several of the noblest structures of the city, including four colleges, the new examination schools, a fine bridge over the Cherwell, together with quaint old houses and elegant modern shops. The Botanic Gardens add to the beauty of the street, which is regarded in many respects as one of the finest in England. Of late years building has extended beyond the old limits, and suburbs of large size have sprung up, besides lines of villas along the Banbury and other roads.

Oxford being the see of a bishop, of course possesses a cathedral. It contains also twenty-five parochial churches, and has places of worship for Wesleyan and Primitive Methodists, Independents, Baptists, and Roman Catholics. The cathedral, which has been recently much improved and embellished, originally belonged to the priory of St. Frideswide, and is also the chapel of Christ Church College; it is a spacious cruciform structure chiefly in the late Norman style, inferior in extent to most English cathedrals, and its exterior is in a great measure concealed by the extensive buildings of Christ Church. St. Mary's, used as the University Church, finely situated on the north side, and nearly in the centre of the High Street, and rendered conspicuous by its richly-decorated tower, terminating in a beautiful spire 180 feet high, still ranks, notwithstanding the incongruous addition of a porch with twisted pillars given to it by Archbishop Laud, as one of the finest Gothic structures of Oxford. St. Martin's or Carfax is a modern structure with an ancient tower, well situated at the crossing of the four great thoroughfares, High Street, Queen Street, St. Aldate's, and Corn Market, and takes its name of Carfax by corruption from the French 'Quatre Voies' (four ways). St. Mary Magdalen presents several beautiful features, and has acquired much additional interest from the Martyrs' Aisle, which has been added as a fit accompaniment of the Martyrs' Memorial—a splendid monumental pile which stands close to it, near the supposed spot where Ridley, Latimer, and Cranmer suffered martyrdom. The principal of the other ecclesiastical edifices of Oxford are the church of St. Aldate, the chapel of Merton College (the transept of which is also the parish church of St. John), the church of St. Peter in the east (the most ancient of all), St. Thomas, All Saints, and the Roman Catholic church of St. Aloysius.

The great boast of Oxford is its university (see OXFORD, UNIVERSITY OF), which, during this age, by adopting a more comprehensive system of teaching, and by removing local and class restrictions, has doubled the number of its students and greatly expanded its sphere of utility. It stands pre-eminently distinguished by the magnificence of its buildings and the richness of its endowments. Of the university buildings the most remarkable are Christ's Church, the largest and grandest of all the colleges, with a magnificent gateway begun by Cardinal Wolsey and completed after the design of Sir Christopher Wren, a magnificent dining-hall, a fine library, and a tower containing the famous bell known as the 'Great Tom of Oxford;' Oriel College, the library of which, a building in the Ionic style, though unfortunately situated, is regarded as one of the most perfect pieces of architecture in Oxford; the chapel of All Souls' College, much admired for the beautiful simplicity of its decoration, and its imposing effect generally; New College, a good specimen of the perpendicular; Balliol College, to which have been added two new wings and a hall; and Magdalen College, distinguished by the fine cloister of its quadrangle, the chaste and elegant decorations of its chapel, and above all by the tower, an exquisite specimen of rather late perpendicular. Besides the buildings of each individual college and hall are others of an equally and even more magnificent description, belonging to all in common, or to the university properly so called. Of these the most important are the Theatre, built by Sir Christopher Wren, and used by the university on great public occasions, and though only 80 feet long by 70 feet broad, so arranged as to accommodate nearly 4000 persons; the new Schools, used for the examination of candidates for degrees, and similar purposes; the Bodleian

library, which was becoming inadequate to contain its vast and increasing treasures of books, records, and manuscripts, is now enlarged by comprising the old Examination Schools, which are part of the same buildings; the Ashmolean Museum, the Radcliffe Library, the Radcliffe Observatory, the Clarendon, the University Printing-office, the Taylor and Randolph Institution, and the University Museum. In connection with the university may be mentioned the Botanic Garden, probably the oldest, but by no means one of the best, in the kingdom; and 'the Parks,' lying between Keble College and the Cherwell, and affording an excellent football-ground and promenade. A new observatory is also being erected here. The buildings and establishments in Oxford not connected with the university or yet referred to, but deserving of notice, are the town-hall, a spacious stone building; a new corn-exchange built contiguously to it in 1863; numerous parochial, National, and other schools; the Radcliffe Infirmary; the Lunatic Asylum, founded by Dr. Radcliffe, on Headington Hill, more than a mile out of the town; the Randolph, a splendid Gothic hotel, near the Martyrs' Memorial; the Bullingdon Barracks, &c. Oxford depends mostly on the university, and has no manufactures worthy of mention. It sends two members to Parliament. In corn a considerable trade is carried on; and for the general purposes of transport great facilities are afforded by the river and the Oxford Canal, and by the Great Western, a branch of the London and North-Western, the Oxford Worcester and Wolverhampton, Cheltenham, Fairford and Buckinghamshire Railways. Population in 1881, municipal bor. 35,264; parl. bor. 40,837.

OXFORD, Lord. See Harley.

OXFORD, University of. The exact age of this ancient institution cannot now be ascertained. The University Calendar assigns the date 872 as that of the foundation of University College, in accordance with the tradition that Alfred the Great founded certain schools at Oxford, which formed the nucleus round which the university grew up; but even if this tradition is correct (which is extremely doubtful), it is nevertheless certain that there was neither university nor college in the proper sense of the words for many generations after this. Oxford is mentioned as a place of education in the beginning of the twelfth century, and the schools there are said to have been shown special favour at that time by Henry I., as they also enjoyed the favour of Richard I. towards the close of the same century. At this period the schools of Oxford were very flourishing, and had assumed the character of a university, such as universities then were, although it is not yet mentioned, so far as we know, by that name. The earliest public instrument known to exist which applies the title of university (*universitas*) to the schools of Oxford is one which dates from the third year of King John's reign (1201), an earlier date than that of any similar mention of the University of Paris. Some authorities assert that the university received its first charter as a corporate body in the reign of Henry III. (1216–72), while others represent that its first charter was that granted to it by Elizabeth in 1570, upon which its privileges depended until the passing of the Oxford University Act of 1854 (17 and 18 Vict. cap. lxxxi.). The elective franchise was conferred upon the university in 1604, since which time it has returned two members to Parliament.

The collegiate system at Oxford dates from the thirteenth century. At first the students who congregated at the university had no special places of abode provided for them, but had to find accommodation for themselves, as they still have to do at the Scotch universities, and indeed nearly all universities except the English ones. As the students found it cheaper to unite and rent a single house in which they might live together than to provide each for himself, they frequently did so, forming halls, hostels, or inns. Sometimes, for the sake of giving greater facilities to study, sums of money would be given or bequeathed to the university for the erection of buildings in which the students might live without any more expense than was necessary for their maintenance. The first who went further than this was William of Durham, who, dying in 1249, bequeathed a sum of money to the university to provide a permanent endowment for the maintenance of a certain number of 'masters.' The first purchase was made in 1253, and with this purchase originated University College. There were other two colleges founded during the same century—Balliol College, between 1263 and 1268; and Merton College, founded at Maldon in Surrey in 1264, and removed to Oxford before 1274. This last college is said to have been the first in which the collegiate system in its modern form, or a form resembling the modern one, was instituted, the college being made a separate corporation, with a separate charter and separate statutes. The endowments previously acquired for the maintenance of masters were merely held in trust by the university for those who were entitled to enjoy them. The first statutes of University College as a separate corporation are dated 1280. For a long time after the foundation of the first colleges the halls continued to be much more numerous. The number of students who could be provided for in the colleges was but a very small fraction of the whole body of students, then several times more numerous than they are now. At the beginning of the fourteenth century, while there were no more colleges than the three just mentioned, there were about 300 halls. As the number of colleges increased, and their growing endowments attracted greater numbers of students, the halls declined in number, especially since the attendance of students diminished in the centuries following the fourteenth. At the beginning of the sixteenth century the number of colleges had increased to twelve, while that of the halls had sunk to fifty-five. There are now twenty-one colleges, all of which are separate corporations, and, with two exceptions, have endowments for fellows and scholars. At Christ Church the fellows and scholars are called respectively senior and junior students. All Souls' College has no scholars, and at Keble College there are neither fellows nor scholars. The fellows and scholars at Oxford hold pretty much the same position as at Cambridge. (See Cambridge, University of, and Fellowship.) Besides the colleges there were lately four halls, which are not separate corporations, and had no endowments for fellows, but these are proposed to be absorbed into different colleges. The following are the names of the colleges and halls according to their rank:—1. Colleges: University, Balliol, Merton, Exeter, Oriel, Queen's, New, Lincoln, All Souls', Magdalen, Brasenose, Corpus Christi, Christ Church, Trinity, St. John's, Jesus, Wadham, Pembroke, Worcester, Hertford, and Keble; 2. Halls: St. Mary, New Inn, St. Alban, and St. Edmund. By far the largest of the colleges is Christ Church. Besides the four halls any member of convocation above the age of twenty-eight might, under certain conditions, obtain a license to open a private hall for the reception of students. In the fifteenth century an enactment was passed requiring all students who joined the university to become members of some college or hall, and this condition continued to be the law until

1868, when persons were permitted, under certain conditions, to enjoy the privileges of the university without so doing, keeping their statutable residence in approved houses or lodgings in the town. Those who avail themselves of this permission are called unattached students. They have to pay a double matriculation fee (£5 instead of £2, 10s.), and to pay £4, 10s. instead of £1 as university dues.

The constitution of the university is fixed by the act of 1854 already cited, which modifies that granted by the act of Elizabeth. The style or title by which the corporation is known is The Chancellor, Masters, and Scholars of the University of Oxford. The governing bodies are the House of Congregation, the House of Convocation, the Congregation of the University of Oxford, and the Hebdomadal Council. The House of Congregation is made up of the regents, who are either *necessario regentes* or *regentes ad placitum*. The former include all doctors and all Masters of Arts for two years after the term in which they are admitted; and the latter, the professors, doctors resident in the university, heads of colleges and halls or their deputies and censors, and deans of colleges, all of whom must, however, be members of Convocation to complete their qualifications as *regentes ad placitum*. The functions of this body are almost confined to ratifying the nomination of examiners by the vice-chancellor and the proctors, and to the granting of ordinary degrees. The House of Convocation is made up of both regents and non-regents, that is, of all who have been admitted to regency, provided their names have been constantly kept on the books of some college or hall, or of the delegates of unattached students. The functions of this body are numerous and important. It confers honorary degrees and others granted out of the usual course by diploma or decree; it elects to nearly all the offices in the gift of the university; it gives the final sanction to all new statutes; and it transacts all the formal business of the university as a corporate body, except what belongs to the House of Congregation. The total number of members of Convocation in 1879 was 5134. A residential qualification is necessary to membership in the case of the Congregation of the University of Oxford, except for certain official persons. The names of the members for the current year are always to be found in the University Calendar. Its business is almost entirely confined to legislation, but it also has the election of all the non-official members of the Hebdomadal Council. This last body consists of certain official and certain elected members. The official members are the chancellor, the vice-chancellor, the late vice-chancellor for one year after he has ceased to hold office or until the next triennial election, and the two proctors. The elected members are—six heads of colleges or halls, six professors, and six members of Convocation of not less than five years standing. The members of Convocation elected may be either heads of houses or professors. The election takes place once in three years. The elected members hold office for six years, and half of them are chosen on every occasion. They meet every Monday in term time (whence the name of the body), and when convoked by the vice-chancellor. All legislative measures originate with them.

The processes by which any proposed new statute becomes law are the following. After the measure has been framed in the Hebdomadal Council it must be promulgated after due notice in the Congregation of the university, and the preamble of the measure approved by this body. Amendments may then be made, and after these have been discussed the question that the statute do pass is submitted to Congregation on a subsequent day, of which three days' clear notice must be given. The council, instead of drawing up a statute in regular form, may submit resolutions to the Congregation, and if these are accepted the Congregation may appoint a select committee to frame a statute embodying these resolutions. After a statute has been passed by Congregation it is submitted after an interval of seven entire days to the House of Convocation for final adoption or rejection.

The principal officers of the university are the chancellor, the high-steward, the vice-chancellor, the two proctors, the public orator, the clerks of the market, the keeper of the archives, and the registrar. The dignities of chancellor and high-steward are almost purely honorary, and are for the most part conferred on noblemen. The vice-chancellor, who is annually nominated by the chancellor from the heads of colleges, is now in fact the supreme executive and judicial authority of the university. The principal duty of the proctors is to maintain the discipline of the university.

There are forty-nine professorships, lectureships, readerships, and teacherships in the University of Oxford, besides the lectureships, &c., in connection with many of the separate colleges. Funds have also been obtained for the creation of a new professorship, but these are to be allowed to accumulate before the chair is established. It is only a few of the professors who actually deliver lectures on the subjects for which they hold their professorships, and as attendance on these lectures is compulsory on none of the students, it depends greatly on the popularity of a professor, or the usefulness of his lectures for degree purposes, whether he has a large audience or not.

The students at Oxford are divided into peers and eldest sons of peers, fellow and gentlemen commoners, and commoners. Peers and eldest sons of peers have certain privileges as to the time of residence allowed for taking their degree, and as to some other things; but these are now generally abolished. The class called fellow or gentlemen commoners, who have certain privileges allowed them on condition of their paying more than other students, is also now abolished in almost every college. In certain colleges there is a class called 'clerks' or 'Bible clerks,' who receive pecuniary assistance towards their education. The class called servitors, who used formerly to receive similar aid on condition of performing various menial services for the other students, appears now to be entirely abolished. Every student on joining a college or hall is assigned to some college tutor, at whose prelections he is required to be present a certain number of times in each term. The students of each college dine together in a common hall, but take their other meals in their own rooms. The expense of living at Oxford depends greatly on the habits of the student, but for one who is economical it is usually calculated to amount to about £200 a year. The number of students who matriculated in 1882 was 757.

There are four terms in the university year at Oxford: Michaelmas term, which lasts from Oct. 10 to Dec. 17; Hilary or Lent, from Jan. 14 to the day before Palm Sunday; Easter term, from the Wednesday after Easter to the Friday before Whitsunday; and Trinity term, from the day before Whitsunday to the Saturday after the first Tuesday of July. Michaelmas and Hilary terms are kept by six weeks' residence in each; and Easter and Trinity terms either by three weeks' residence in each, or by forty-eight days in both jointly.

The degrees conferred by the university are those of Bachelor and Master in Arts, and Bachelor and Doctor in Music, Medicine, Civil Law, and Divinity. The most important function of the university, how-

ever, is the conferring of degrees in arts. Twelve terms of residence are required for the degree of B.A., and for the position of S.C.L. (student of civil law) or S.M. (student of medicine). No further residence is necessary for any degree, and no residence whatever is required for degrees in music. Candidates for the degree of B.A. must pass three distinct examinations: Responsions (known among undergraduates as the 'Little Go' or 'Smalls') before the masters of the schools (six in number); first public examination before the moderators (in the classical school seven, in the mathematical three); and the second public examination before the public examiners (six in the pass school, five in the school of literæ humaniores, and three in each of the other five honour schools, namely, mathematics, natural science, jurisprudence, modern history, and theology). Candidates are admitted to the first public examination at their fourth, or any subsequent term, and to the second public examination at the twelfth or any subsequent term. Honours may be obtained in each of the two public examinations. In the first public examination honours are conferred in the two departments of classics and mathematics. Candidates are admitted only from their fifth to their eighth term inclusively, and must of course stand a severer examination than candidates for a mere pass in the department in which they aspire for honours. The successful candidates are arranged by the moderators according to merit in three classes, in each of which the names are published in alphabetical order. It is a very rare and highly coveted distinction to take what is called a 'double-first,' that is, a place in the first class of both honour lists. In the second public examination honours are conferred in each of the six honour schools already mentioned. Candidates are admitted only from their twelfth to their sixteenth term inclusively. Successful candidates are arranged by the public examiners in four classes according to merit, and their names published in these classes in alphabetical order. The standard of qualifications necessary to obtain a place in the highest of these classes is very high indeed. Candidates in the Pass School, according to the present system (the first examination under which was held in Michaelmas term, 1874), are examined in three out of ten specified subjects, which include Greek and Latin, outlines of Greek and Roman history, modern history, a modern language (either French or German), elements of political economy, a branch of legal study, elements of geometry, mechanics, chemistry, physics. The ten subjects are arranged in three groups, and the candidate may choose his own subjects with these limitations, first, that not more than two may be taken from any one of the three groups; and secondly, that one of the three subjects chosen must be either of the following: 1. Two books, either both Greek, or one Greek and one Latin, one of such books being some portion of a Greek philosophical work, and the other a portion of a Greek or Latin historian. 2. A modern language, either French or German, including composition in the language, and a period of its literature.

A B.A. may proceed to the degree of M.A. without further examination or exercise, in the twenty-seventh term from his matriculation, provided he has kept his name on the books of some college or hall, or upon the register of unattached students for a period of twenty-six terms. In the case of all other degrees (except honorary ones) some examination or exercise is necessary. An S.C.L. may obtain the degree of B.C.L. (after examination) in his twenty-seventh term, and that of D.C.L. at the end of five years from his promotion to the former degree; and an S.M. that of B.M. in his twenty-eighth term, and at the end of three years from the date at which he is advanced to this degree may obtain that of M.D. An M.A. may become a B.D. at the end of three years from his admission to regency, and a B.D. may become a D.D. at the end of four years from his admission to the degree of B.D.

The following institutions are connected with the university: the Bodleian Library, the Radcliffe Library and Observatory, the Clarendon (formerly containing the Clarendon Press, now used for various public purposes of the university) and Clarendon Press, a theatre (for public ceremonials), the Taylor Institution, and the University Galleries, Museum, Observatory, Laboratory, and an Indian Institute. As separate articles will be found on the most important of these, it is unnecessary to do more than mention them here. See the article OXFORD.

The University of Oxford enjoys in its own right the patronage of but few church livings; but by 3 James I. cap. v., by which Roman Catholics are disabled from presenting to any ecclesiastical benefice, their rights within twenty-five of the counties of England and Wales are made over to this university, those in the other twenty-seven counties being conferred on that of Cambridge. There are also forty-one scholarships in the gift of the university, besides those belonging to the various colleges and halls.

OXIDES, the name given to the compounds of oxygen with one other element; thus hydrogen and oxygen form *oxide of hydrogen* or *hydrogen oxide*, oxygen and chlorine form a series of *oxides of chlorine*, oxygen and copper form *oxide of copper* or *copper oxide*, and so on. When two oxides of the same element exist, the name of that which contains the greater proportion of oxygen ends in *ic*, while the name of the oxide containing less oxygen ends in *ous;* thus we have N_2O, called *nitrous oxide*, and N_2O_5, called *nitric oxide*. If there be several oxides they may be distinguished by such prefixes as *hypo*, *per*, &c., or by the more exact prefixes *mono*, *di*, *tri*, *tetra*, &c. Thus we have N_2O_5, which might be called *per-nitric oxide;* but as we know higher oxides, namely, N_2O_4 and N_2O_5, this name should apply with even greater force to these bodies, we therefore prefer to name the series of nitrogen oxides thus:—

N_2O.....Nitrogen *mon*oxide.
N_2O_2.....Nitrogen *di*oxide.
N_2O_3.....Nitrogen *tri*oxide.
N_2O_4.....Nitrogen *tet*roxide.
N_2O_5.....Nitrogen *pent*oxide.

For a description of the different oxides see the various articles on the individual chemical elements.

OXUS, AMOO, AMOO-DARIA, or JIHOON, a large river in Asia, which issues from the small mountain lake Sir-i-Kol, within the district of Pamir; lat. 37° 27′ N.; lon. 73° 40′ E., at an elevation of 15,600 feet above sea-level; flows south-west to about lat. 37° N.; lon. 68° E., when it somewhat abruptly turns to the north-west, which course it continues to hold without any very wide deviations till it falls into the Sea of Aral by several mouths, forming an extensive marshy delta. The lower part of the course of the Oxus was at one time different from what it is now, having its mouth in the Caspian Sea. This ancient bed is called Urun-Daria (that is, 'old river'), and consists of two arms, the Laudan (or Lausak) Channel and the Kunja-Daria, the former of which is much shorter than the other. On or near the banks of the Kunja-Daria are to be seen ruins of towns and settlements, pointing to two distinct epochs. The remains of the earlier epoch (found in great abundance at Kunja-Urgenj, the ancient capital of Charism, situated at the south-east of the Sea of Aral, give evidence of a much higher civilization than those of the later epoch, which show that at a com-

paratively recent period this region must have been inhabited by a people having the same customs and modes of life as the present inhabitants of Khiva. The entire length of the Oxus in its present course is 1314 miles, and the extent of its basin 221,256 square miles. It has numerous and considerable tributaries, but little or nothing is known about them. The regions it traverses are for the most part sandy, barren, and wholly uninteresting. By an arrangement come to in 1873 between the governments of Russia and the United Kingdom, the upper part of the Oxus was recognized as the boundary between Afghanistan and Bokhara, in accordance with a treaty previously concluded, at the instance of Russia, between the Khan of Cabul and the Emir of Bokhara.

OXYGEN. This gas is the most widely distributed of all the elements. Eight-ninths by weight of water, one-fourth of air, and about one-half of silica, chalk, and alumina consist of oxygen. It enters into the constitution of nearly all the important rocks and minerals: it exists in the tissue and blood of animals; without it we could not live, and by its agency disintegration of the animal frame is carried on after death. All processes of respiration are carried on through the agency of oxygen, all ordinary processes of burning, of slow decomposition or eremacausis, and of producing light are possible only in the presence of this gas. To oxygen we are indebted for the existence of such operations as bleaching, iron-making, &c.; it is oxygen that enables us to produce that all-important substance oil of vitriol; it is oxygen that enables us to turn grapes into wine, and wine into vinegar; to this agent we are indebted for the beautiful tints of flowers, and for the ripening of fruits. Indeed it would be difficult to mention any extensive operation going on around us, whether in nature or in the arts, which is not directly or indirectly connected with oxygen gas.

On the 1st of August, 1774, Joseph Priestley discovered a new gas, to which he gave the name of *dephlogisticated air*. About this time Priestley had given him a quantity of a red powder containing mercury; this red powder he placed on the surface of a quantity of mercury in a small tube inverted in a reservoir of the same metal, and exposed it to the action of the sun's rays concentrated by means of a lens: after a time he noticed that the powder was gradually disappearing, and that some kind of gaseous matter was collecting in his apparatus. On testing this gas he found that it possessed properties different from those of common air: a lighted body plunged into it burned with great brilliancy; an animal lived in it for a short time, but then expired; and so on. In the following year Lavoisier put forward the opinion that the new gas obtained from red oxide of mercury is identical with the substance which exists in common air, and there serves as the supporter of combustion and respiration. Lavoisier prepared oxygen by the same method as that used by Priestley: he heated mercury in a closed vessel for several days until a considerable quantity of the red oxide was formed, which he then removed, and placed in a small retort; on heating this substance he obtained a certain volume of the new gas, and this volume he found to be almost identical with the volume of air absorbed by the mercury when it was heated at the beginning of his experiment in a closed vessel. From this and other experiments Lavoisier concluded that when metallic mercury is heated in the air it absorbs a portion of this air, and forms the new substance, red oxide of mercury, which, upon heating, again gives up this absorbed air; the mercury serves as a carrier of this air (oxygen) from the atmosphere to any vessel in which it may be desired to obtain it pure. About the time of Priestley's discovery a poor Swedish apothecary, whose name is now famous in the annals of science, *Scheele*, independently discovered oxygen: Scheele called it 'empyreal' or 'royal air;' but Lavoisier gave to this gas the name by which it is still known, namely, oxygen—from the Greek *oxus*, acid, and *gennaō*, I produce—because he supposed that it was present as the active constituent in all acids. To produce oxygen we generally employ a substance called potassium chlorate: this salt contains nearly 40 per cent. of its weight of oxygen, and the whole of this can be obtained by heating the chlorate. To facilitate the expulsion of the oxygen at a moderate temperature the chlorate is mixed with sand, iron-filings, or a black powder called manganese dioxide; the mixture is placed in a flask fitted with a delivery tube; the flask is heated, and the gas is collected at the pneumatic trough. The following equation represents what takes place: $KClO_3 = KCl + O_3$. The substance KCl (potassium chloride) remains in the flask mixed with the manganese dioxide, which is unaltered by the reaction. It has been proposed to derive oxygen from the air by means of such a substance as baryta, which, when strongly heated in air, takes up an additional atom of oxygen, which may again be easily removed, the original baryta being thus reproduced.

Oxygen is colourless, inodorous, and tasteless; it is the least refractive, but the most magnetic of all the gases: it is rather heavier than air, having a specific gravity of 1·1056, referred to air as 1·00; it is soluble in water to the extent of about three volumes in 100 volumes of water at ordinary temperatures. Oxygen was liquefied for the first time in December, 1877, when M. Cailletet of Chatillon-sur-Seine, and M. Raoul Pictet of Geneva, both accomplished this by independent experiments. It has not yet been solidified. Nearly all natural waters contain dissolved oxygen; although the quantity cannot, under ordinary circumstances, exceed 3 per cent., yet this small proportion of oxygen makes submarine animal life possible. Oxygen is possessed of very marked chemical activity; with all the elements, fluorine alone excepted, it may be made to unite either directly or indirectly. Some substances when brought into contact with this gas unite with it so violently as to produce light and heat; thus, if very finely divided iron or lead be shaken into a vessel containing oxygen, each particle of the metal takes fire, and burns as it meets with the gas.

The action of oxygen upon certain substances is much more gradual; thus, if a clean plate of lead be allowed to stand in the air its surface speedily becomes tarnished, owing to the formation of a thin film of oxide; so also a piece of wood if exposed to the action of the air gradually rots away. This process is a slow oxidation of the wood by the oxygen of the air. Other substances again must be heated before they will unite with oxygen; thus, if a small piece of sulphur be brought into a jar containing oxygen no action ensues; but if the sulphur be caused to burn, and then plunged into the oxygen, the brilliancy of the burning is greatly increased, and a compound of sulphur and oxygen is produced. This power of supporting combustion is one of the leading features of the gas we are speaking of. Several striking experiments may be performed, all tending to show the brilliancy with which bodies burn in oxygen gas. If an ordinary watch-spring be bent into a spiral form, and one end be tipped with sulphur, on igniting the sulphur, and plunging the watch-spring into a jar full of oxygen, the iron burns most brilliantly, throwing out sparks on all sides. If hydrogen be burned in oxygen the temperature of the flame is exceedingly high, so high indeed that if a jet of the

mixed burning gases be caused to impinge on a quantity of iron nails, the nails are entirely burned with most brilliant scintillations, a perfect stream of red-hot oxide of iron being thrown about on all sides. The great heat of this oxy-hydrogen flame is taken advantage of for illuminating purposes, by bringing into the flame a solid substance which is infusible at the temperature of the flame, and which becoming intensely hot and yet remaining solid radiates light in all directions. The substance commonly employed is a cylinder of lime, which is one of the most infusible substances with which we are acquainted. The light radiated by the intensely heated lime is very brilliant, and may easily be seen at a distance of very many miles.

The presence of oxygen is, so far as we know, one of the physical conditions of life: in inspiring we, along with all animals, receive into the lungs a supply of oxygen: this oxygen is carried by the blood to the various parts of the body, and there deposited to do its work of tissue-forming, &c.; the deoxygenated blood returns, and again receives a fresh supply of the necessary oxygen. That a process analogous, if not identical with ordinary combustion, is proceeding in our bodies, may be shown by expiring into a quantity of clear lime water; the lime water becomes turbid owing to the formation in it of solid particles of chalk (calcium carbonate); this is proof of the presence of carbonic acid in the expired breath, and carbonic acid is the product of the combustion of carbon—a substance largely present in the animal frame—in oxygen gas.

When oxygen unites with another element the product is called an *oxide;* the oxides form a most important series of chemical compounds. For a description of the individual members of this series reference must be made to the articles on the various chemical elements.

Until the discovery of this gas oxygen no well-founded explanation of the facts of combustion was known; in the later alchemical era the doctrine sprung up that when bodies burn they part with a something called *phlogiston;* and that it is the outrush of this substance which causes the phenomena of heat and light exhibited in all cases of ordinary combustion. In the year 1630 Jean Rey, a French physician, noticed that the residue which remains when tin and lead burned in the air is heavier than the metals themselves before burning. For many years this observation of Rey's remained unfruitful. Chemists for the most part knew that when substances burn, air is absorbed, and that the burned substance really weighs more than the unburned substance. In 1674 the Honourable Robert Boyle, in his Tract entitled 'Suspicions about some Hidden Qualities of the Air,' and in other works, refers to the probable existence of something in the air which is abstracted during combustion, although he does not seem to have put forward the view that the union of this something with the metal was the cause of the increase of weight observed; he rather referred this increase in weight to the passage of ponderable heat corpuscles through the vessel in which the metal was heated, and to the union of these with the metal. After a time, when the theory of the ponderability of heat began to be less in vogue, the fact of the increase in weight during combustion was overlooked, and the phlogistian theory prevailed. The way towards a true theory of combustion having been prepared by Black—whose remarkable experiments, made in 1754, on the mild and fixed alkalies stand forth as the first great chemical quantitative research; by Cavendish, who proved that water is a compound of oxygen and hydrogen; and by Priestley's brilliant discovery—at last the man appeared who wove together these various threads into a homogeneous covering. This man was Lavoisier. (See the article LAVOISIER.) He showed that oxygen is the substance which burning bodies abstract from the air, that the product of combustion is the original body plus oxygen, and that wherever the phlogistians averred that a substance lost phlogiston, it really absorbs oxygen. To account for the increase in the weight of substances when burned, the upholders of the old theory were fain to say that phlogiston not only is imponderable, but that it is a *principle of levity*, that its presence in a substance causes that substance to weigh less than it would do were the phlogiston absent. As science advanced, and as quantitative methods of research became more delicate and more trustworthy, this explanation was shown to be utterly worthless; and the theory of Lavoisier prevailed. It is impossible here to trace the further advancement of the theory of combustion step by step; nowadays we hold with Lavoisier that when a body burns in air it unites with oxygen, and that the product of combustion weighs more than the unburned body because of the weight of the absorbed oxygen. We, however, widen the meaning of the term combustion, and apply it to all cases of chemical action in which light and heat are produced, whether oxygen be present or not. Thus hydrogen burns in chlorine, turpentine dropped into the same gas takes fire, phosphorus burns in iodine vapour, and so on: these are true instances of combustion in the modern meaning of the term. Nevertheless the cases in which oxygen acts as a supporter of combustion are very numerous, and well entitle this gas to be called *par excellence* the supporter of combustion.

It is only within a comparatively recent period that the meaning of the terms 'combustible' and 'supporter of combustion' have been truly defined. These terms are only relative. Hydrogen burns in oxygen; but change the conditions, cause a stream of oxygen to flow into a jar of burning hydrogen, and the opposite is true. Now oxygen burns in hydrogen. In order that combustion should take place chemical combination between at least two substances is necessary: if a stream of hydrogen issue into oxygen or air, and a light be applied, chemical combination takes place between the particles of hydrogen and the surrounding particles of air; as the hydrogen particles are carried forward in the atmosphere of oxygen, combustion, with its attendant phenomena of light and heat, takes place principally at the edge of this moving stream of hydrogen particles: we say that the hydrogen burns and that the oxygen supports combustion. But suppose the atmosphere to consist of hydrogen and a stream of oxygen particles to be carried through this atmosphere, on applying a light combination takes place chiefly between these particles of oxygen situated near the edge of the stream and the hydrogen particles which come in contact with these; the oxygen now appears to burn in the hydrogen. Many circumstances have to be taken into account in considering the actual process of combustion. The mechanical division of the substance burning, if a solid, the temperature of ignition, the rate of propagation of combustion, and a host of other questions, arise: these cannot be discussed here; the reader must refer to the manuals of chemistry and natural philosophy. Oxygen exists in another form different from that of the ordinary gas; in this form it exhibits many marked peculiarities. See OZONE.

OXY-SALTS. Salts are produced by the mutual action of acids and bases (see Acids and Bases under CHEMISTRY); oxy-salts are those salts which contain oxygen. The oxy-salts form a very important series

of substances; among them are included all the sulphates, nitrates, oxides, hydrates, chlorates, bromates, iodates, carbonates, borates, silicates, &c., in fact by far the greater number of chemical compounds may be classed under this great general heading.

OXYURIS. The generic name of the 'Thread-worms,' a species of which—*Oxyuris vermicularis*, or the 'Small Thread-worm'—infests the lower bowel of children especially. See NEMATELMIA.

OYER AND TERMINER (French, to hear and determine), in English law, is a court held by virtue of a royal commission, to hear and determine all treasons, felonies, and misdemeanours. This commission is usually directed to two of the judges of the circuit, and several gentlemen of the county; but the judges only are of the quorum, so that the rest cannot act without them. It is usually granted when any sudden insurrection breaks out, or when from any cause there is an unusual press of business. See ASSIZES.

OYSTER (Pl. CXXX.-CXXXI. fig. 22.). This famous edible mollusc is one of the Lamellibranchiate Mollusca, and a near ally of the mussels, &c. It forms the type of the genus *Ostræa*, and also of the family *Ostræidæ* the members of which are distinguished by the possession of an inequivalve shell; the one half or valve being larger than the other, a condition produced by the habits of these animals in lying on one side; the lower valve being the deeper. In shape the shell is inequilateral, and may be free, or simply attached by calcification to fixed objects, or may be simply imbedded in the mud. The hinge of the shell is not toothed. The ligament, through the elasticity of which the shells are opened, is internal. The lobes or halves of the mantle lining the shell are free and unconnected to each other. The foot is small and rudimentary, or may be wanting. A single (adductor) muscle for closing the shell is developed. No syphons exist in connection with the supply of water to the gills for breathing.

The Common Oyster (*Ostræa edulis*) is the most familiar member of the genus; other species being the Horse-foot Oyster (*O. hippopus*), the Rosy Oyster (*O. rosacea*), the Milky Oyster (*O. lacteola*), the Crested Oyster (*O. cristata*), the Folded Oyster (*O. plicata*), the Foliate Oyster (*O. lamellosa*). These last five species are common in the Mediterranean Sea, and many varieties of these and other species have been described. The fry or fertilized eggs of the oyster are termed 'spat,' and enormous numbers of eggs are produced by each individual from May or June to September—the spawning season. The eggs are retained for some time within the mantle-folds, and from the white appearance of the spat and its investing mucus, the oysters have, when breeding, been termed 'in the milk' or 'sick.' The spat being discharged, each embryo is found to consist of a little body inclosed within a minute but perfectly formed shell, and possessing a swimming-pad or organ provided with vibratile filaments or cilia, by aid of which the young animal swims freely about. During its free swimming period the oyster-spat is exposed to the attacks of many enemies; large numbers are thus destroyed, but such as survive attach themselves by means of the 'pad' to some fixed object. At the end of a month after extrusion from the parent body the young animal attains the size of a pea; in six months it reaches a size of three-quarters of an inch; and in about three years it may be said to attain its full growth. The oysters congregate together in their attached state to form large submarine tracts or 'oyster-beds,' as they are termed. The localities of these 'beds' have in many instances been accurately ascertained. In England the Gravesend beds are famous deposits, and those extending along the coasts of Kent and Essex are also celebrated. The beds in the Frith of Forth are also numerous; and those of Rochelle in France, Rochefort, Ré and Oleron, Cancale, Ostend, and Granville, are noted for their oyster-produce. Of Denmark the most famous perhaps are the Schleswig oyster-beds, and those at the point of Jutland and at Skagen are also familiar. The most favourable bottom and locality for oyster-beds appear to be those situated in parts where the currents are not too strong, and where the sea-bed is shelving, and covered by mud and gravel deposits. In America the Virginian beds are of large extent; those of Georgia are also of great size; and the sea-board of Long Island is also occupied by such valuable stores of marine life. The question of oyster protection and cultivation has engaged the attention of legislators, naturalists, and men of commerce for very many years. And there can be no doubt that the due study of the reproductive history of this mollusc, and the framing of laws in accordance with the naturalist's knowledge, has greatly tended to improve, in this country at least, the waning and declining prospects of the oyster. On the Continent the oyster has been cultivated with great success, and very profitable results; and the British nation might well take example by the perseverance and industry of the French in this respect. Pliny tells us that Sergius Orata cultivated oysters at Baiæ in the days of Lucius Crassus the orator. Sergius grew and bred these molluscs in the Lucrine Lake, which is now nearly silted up. In Lake Fusaro, near Naples, the work of oyster-culture is successfully carried on, although in a somewhat primitive manner. In 1858 the oyster-culture of France, which had greatly declined, received a new impulse, and in the Bay of St. Brieuc, in the Bay of Arcachon, at the Isle of Ré, at Marennes—this last a very successful station—the molluscs are bred and grown with great care and success. At Whitstable, in England—the famous depot for 'natives'—an oyster farm exists, and is managed on a co-operative principle. This farm employs 3000 hands, and pays in wages an annual sum of £160,000. The 'native' oysters are those reared in the farms or ponds. In these farms the entire layers of oysters are gone over and examined; overcrowding is remedied by 'planting' in other parts; the sickly or diseased oysters are removed, and the health and growth of the community are thus insured. In Scotland the oyster is left pretty much to itself and to nature, and hence has arisen the depopulation of the once famous beds of the Frith of Forth. The 'Pandores' of Prestonpans are things of the past, and the fishings are almost totally closed.

From the earliest times oysters have formed delicacies and food for man. The kitchen-middens of the prehistoric period, found in Northern Europe, bear testimony to the use made of this mollusc for food by the primitive inhabitants. The Romans were great admirers of the bivalve, and more modern potentates and rulers have carried their admiration for the oyster to very great lengths. The price of oysters has varied greatly under the changes to which its eventful history has been subject. In Russia they are said to cost nearly 1*s.* each, and in Sweden about 5*d.* each. In England the price of late years has varied from 1*s.* 6*d.* to 3*s.* a dozen for good 'natives.' These molluscs are obtained chiefly by dredging. The flesh is esteemed highly nutritious and digestible in the raw state, and they have been recommended by physicians in cases of diseased appetite, in the endeavour to restore tone and simplicity to the digestive system. The green tinge observable in European oysters arises, it is most generally supposed, from the presence of minute Confervæ or lower plants on which these forms in part

feed. Other opinions hold that this green colour is due to the presence of diseased or abnormal conditions in the molluscs, or that it proceeds from colouring matter in the soil of the reservoirs or ponds in which the bivalves are placed. America exports to this and other countries large quantities of her home-grown oysters, packed in hermetically sealed tins, and in this less costly form the bivalves are now largely used.

The Hammer Oysters (*Malleus vulgaris*), so called from the obvious resemblance of the shell to the shape of a hammer, belong to a different family, that of the Aviculidæ. To this latter family also belongs the famous Pearl Oyster (*Meleagrina margaritifera*, Pl. CXXX.–CXXXI. fig. 18) of the Indian and Pacific Oceans, which secretes the valued jewels of that name. See also MOLLUSCA, NACRE, PEARL.

Oyster-beds being below the medium line of the tides belong by right to the crown, and can only be claimed as private property in virtue of a royal grant. In Ireland the Irish Fishery Commissioners are empowered to grant a license to the proprietors of the land adjoining the shore, to mark out portions of the shore contiguous to their land for oyster-beds, and to hold them as private property. The law with regard to oyster-beds, where not modified by local statutes, is that any person stealing oysters or oyster-brood from any oyster-bed, laying, or fishery, or using any dredge, net, or other instrument within the limits of any such oyster-fishery, for the purpose of catching oysters or oyster-brood, or dragging the ground of such oyster-fishery with any instrument whatever, is guilty of a misdemeanour, and renders himself liable to be punished by fine or imprisonment. This law, however, is not intended to prevent any person from fishing for *floating* fish within the limits of such oyster-fishery, or using instruments adapted for taking floating fish only. See act 24 and 25 Vict. cap. xcvi. sec. 25. In order to prevent the total extirpation or great diminution of the supply of oysters a close season has been fixed, by a convention between England and France, applying to the seas between the two countries. The close season lasts from the 1st of May to the 31st of August following, and during this season no oysters are allowed to be imported into either France or the United Kingdom from the seas to which the convention applies. Any oyster-boat may be boarded by the officers of the coast-guard during this season, with the view of preventing any illegal taking of oysters. See 6 and 7 Vict. cap. lxxix.

OYSTER BAY, a village in the United States, in the state of New York, Queen's county, on the north coast of Long Island, at the head of a sheltered bay. It is 25 miles east by north of the city of New York, and is a favourite watering-place for the inhabitants of that city. Pop. 1255.

OYSTER-CATCHER (*Hæmatopus ostralegus*), a bird belonging to the order of Grallatores or Wading Birds, and nearly allied to the Plovers (Charadriidæ). The hinder toe in the oyster-catchers is wanting. The bill is of great length, of pentagonal shape at its base, slightly bent upwards, and flattened or compressed at the apex, at which part it is truncated or abruptly terminated. In length this bird measures about 18 inches. The plumage is coloured black and white. The bill is orange in colour. It is a permanent resident in Britain, and frequents the sea-coast, where it wades in search of its food, which consists of Mollusca and crabs. Its popular name is derived from the supposition, that by aid of its bill it could open even the close bivalve; but this is hardly feasible, although it detaches limpets from the rocks with facility. It swallows the smaller shell-fish entire. Of itself, the oyster-catcher typifies the sub-family *Hæmotopodinæ*, a division of the Plover family. (Pl. CXLVIII.–CXLIX.)

OZIERI, or OTHIERI, a town in the Island of Sardinia, in the province of Sassari, in a hollow open only to the north, and inclosed in all directions by lofty heights. It is the seat of a bishop, and has manufactures of woollen and linen cloth; and a trade in wool, skins, horses, and dairy produce. Pop. 7965.

OZOKERITE. This name is applied to a fossil resin which occurs extensively on the eastern side of the Caspian, in Moldavia, in Austria, and in the Urpeth Colliery, Newcastle-on-Tyne. This resin has a brown or brownish-yellow colour, appearing green by reflected light; its odour is pleasantly aromatic; it melts about 70° C. There appear to be at least two varieties, which differ in their melting-points, solubility in ether, &c. Ozokerite contains carbon and hydrogen in the proportion of 86 per cent of the former to 14 per cent of the latter. When distilled this substance breaks up, yielding paraffin and other products. Ozokerite, like other hydrocarbons, burns in the air with a luminous flame; it has been used as a substitute for wax candles.

OZONE. When an electric machine is set in operation a peculiar smell may be perceived; after a discharge of lightning the same smell is perceptible. If a stick of phosphorus be partially immersed in tepid water, the other part of the phosphorus being exposed to the air, or if a little ether be placed in a glass and a heated rod be dipped into the vessel so that it nearly touches the ether, the peculiar smell is again evolved.

The substance which manifests this odour is called ozone (from Greek *ozō*, I smell). In each experiment mentioned above ozone is produced. The Swiss chemist Schönbein drew attention to this substance in the year 1840; he regarded ozone as a compound of hydrogen and oxygen. The experiments of Andrews and Tait have, however, shown that from ozone nothing but oxygen can be obtained; and Soret has demonstrated the fact that three volumes of oxygen, when exposed to the action of the silent electric discharge, are condensed to two volumes of ozone. Andrews has shown that ozone decomposes iodide of potassium with liberation of iodine, and that if two volumes of ozone be caused to act on iodide of potassium the gaseous product of the reaction consists of two volumes of oxygen; in addition, therefore, to that part of the ozone which has done work in decomposing the iodide of potassium there remains a volume of oxygen equal to the original volume of ozone. These results are in keeping with those of Soret, and the conclusion from all the experiments is that ozone is a modified—technically an *allotropic*—form of oxygen, and that two volumes of ozone contain three volumes of oxygen condensed to two volumes. The formula of ozone is therefore O_3. Ozone exists in small quantities in the air of the country; in town air it cannot be detected. On the reaction just mentioned, namely, the decomposition of iodide of potassium, is based a method for measuring the relative amounts of ozone in different airs. Iodine, in the free state, forms a blue substance with starch; if, therefore, a piece of paper be moistened with iodide of potassium and starch, and exposed to the action of ozone, a more or less deep blue colour will be produced, the depth of colour depending primarily on the amount of iodine set free, this again being dependent on the amount of ozone present. If a series of equal-sized papers be prepared in exactly the same way, and if a series of tints be fixed on, which shall be called respectively 1, 2, 3, &c., it is easy to find the relative amount of ozone in any air by exposing the paper for the standard length of time, and then comparing the depth of colour with

the standard series. Ozone acts as a very powerful oxidizer; for this reason it is of great service in the atmosphere, as it so readily oxidizes, and thus renders comparatively unhurtful, animal effluvia and other obnoxious products of animal or vegetable decomposition. When brought into contact with lead sulphide ozone quickly causes the formation of lead sulphate; hence it is used as a restorer of the white colour in oil-paintings where lead-white has been used, which, by the influence of the sulphureous fumes so often present in the air, is soon converted, wholly or in part, into black lead sulphide. Ozone rapidly bleaches indigo, converting it into a white substance called isatin, which contains more oxygen than the indigo itself. Moist iron, copper, mercury, and silver absorb ozone, being converted into their respective oxides. In some of its actions, however, ozone appears to act as a deoxidizer; thus on mixing ozone with peroxide of hydrogen oxygen is evolved in large quantities, and water remains; or if dry ozone be passed over silver-leaf it is decomposed, and at the end of the reaction the silver remains as it was at the beginning. These actions may be accounted for by supposing that the oxygen atoms in ozone are in different polar states, and that in contact with peroxide of hydrogen two of these atoms combine with two oxygen atoms of the peroxide, producing thereby two molecules of oxygen, while one molecule of water remains behind. The following equation exhibits this reaction:—

$$\overset{-}{O}\overset{+}{O}\overset{-}{O} + H_2\overset{-}{O}\overset{+}{O} = H_2O + 2\overset{-}{O}\overset{+}{O}.$$

Ozone. Peroxide of Hydrogen = Water. Oxygen.

Similarly the reaction with silver may be accounted for by supposing that the first effect of the ozone is to produce oxide of silver, and that this is then decomposed with evolution of oxygen and reproduction of the metal; thus—

$$(1.)\quad Ag_2 + \overset{-}{O}\overset{+}{O}\overset{-}{O} = Ag_2\overset{+}{O} + \overset{-}{O}\overset{+}{O}.$$

$$(2.)\quad Ag_2\overset{+}{O} + \overset{-}{O}\overset{+}{O}\overset{-}{O} = Ag_2 + 2\overset{-}{O}\overset{+}{O}.$$

P.

P, the sixteenth letter and twelfth consonant in the English alphabet. It is one of the mutes and labials, and represents a sound produced by closely compressing the lips till the breath is collected, and then letting it issue. The letter which it most closely resembles is *b*, and it is with this letter that it most frequently interchanges (see B); but it is also often interchanged with the other labials *f* and *v*, and sometimes with the labial liquid *m*, as in Molly for Polly. The change of *p* into *v* is common in Italian, and still more common in French. In Italian we have *coperta* and *coverta*, *soprano* and *sovrano*; *povero*, from the Latin *pauper*, &c. This substitution of *v* for *p* is more common in the older Italian language than in the Italian of the present day. Thus, the older Italian has the forms *overare* and *cuvido* for the more modern *operare* and *cupido*. In French *p* becomes *v* in *avril* (Latin, *aprilis*), *chèvre* (Latin, *capra*), *genièvre* (Latin, *juniperus*), *neveu* (Latin, *nepos*), *œuvre* (Latin, *opera*), &c. Examples of the change of *p* into *f* are: French, *chef* (Latin, *caput*), *frésaie* (Latin, *præsaga*). A more striking and yet a common interchange is that between *p* and the guttural mute *k*. Thus, Ionic Greek prose has instead of *pōs*, *hopōs*, *poios*, &c., *kōs*, *hokōs*, *koios*, &c. The Greek *lukos* and *hepomai*, are in Latin *lupus* and *sequor*. The modern Walachian (a Romance language) has *apa* for the Latin *aqua*, *cpa* for *equa*, *keptu* for *pectus*, *keptine* for *pectine*, &c. Another interchange of this letter is with *t*, as in the Æolic *pisures* and the Attic *tessares* (signifying four). The Greek *π′* as a numeral represented eighty, but *π* 80,000. In inscriptions, however, Π often stands as a contraction for *pente* (five). The letter *p* is wanting in Arabic, and Turks, Persians, and Mussulman Hindus, who have the sound and use the Arabic alphabet, distinguish it in writing by a diacritic mark annexed to the character which stands for *b*. The sound is also absent in Japanese. In music *p* signifies *piano* (softly). On medals *P* stands for various names of persons, places, offices, &c., as *pater*, *populus*, *pius*, *perpetuus*, *pontifex*, *proconsul*, &c.; *P.P.* stands for *pater patriæ*; *S.P.Q.R.*, *senatus populusque Romanus*; *P.M.*, *pontifex maximus*; *P.C.*, *patres conscripti*. On French coins *P* is the mark of the mint of Dijon. On visiting cards *P.P.C.*, *P.F.S.A.*, or *P.D.A.* are abbreviations for *pour prendre congé*, *pour faire ses adieus*, or *pour dire adieu*, and signify the taking of leave. (See ABBREVIATIONS.) It has often created surprise that the Latin character for this letter should be identical with that of the Greek Rho (R). But this is merely an accidental coincidence. An examination of ancient monuments shows that the Latin *P* was gradually formed from the Greek Π, while the Greek P (*Rho*) was similarly independently formed from a different original.

PACA (*Cœlogenys*, Pl. CLXXII.–CLXXIII. fig. 23), a genus of Rodent Mammalia, allied to the Capybaras and Cavies, and Agoutis, and included in the family Caviidæ. The Pacas possess eight rootless molar or grinding teeth in each jaw. The body is somewhat thickly set, the average length being about 2 feet, and the height averaging about 1 foot. The hinder legs are longer than the front members, but the former are bent, so that a great proportion of their surface touches the ground. The toes are provided with strong claws. The eyes are of large size and prominent. The ears are long and nearly destitute of hairs. The whiskers are also long and bristle-like. In habits these forms are chiefly nocturnal and herbivorous; and are said to devastate the sugar-cane plantations. They excavate burrows of superficial nature in woody districts, each burrow possessing three openings, and being generally situated in the neighbourhood of water. They are found in the eastern portion of South America, from Paraguay to Surinam; and they were formerly common in certain of the West Indian Islands. They run swiftly, and swim and dive with facility. The flesh is said to be savoury, and is commonly eaten in the native regions of the animal. The cry or voice resembles the grunting of the pig, to which animal, indeed, the Paca bears a general resemblance. The name Paca is a corruption of the *Pag* of the Brazilians or of the Paraguayan word *Paig*. A single young one is produced at a birth. In captivity these animals become sullen, and do not in any case evince a high degree of intelligence; but their general domestication, with a view to their flesh being used as food, has been suggested as feasible in South America. Its skin might be used in the manufacture

of leather. The tail is rudimentary, and all the Pacas possess very largely developed *zygomatic arches* of the skull, inclosing a pouch-like cavity or sac, the function of which is unknown. True cheek-pouches also exist. The Brown Paca (*Cœlogenys subniger*), is a familiar species, as also is the Black Paca (*C. niger*). The bodies of both are marked by four or five bands or bars of whitish oblong spots, which pass from the shoulders to the haunches.

PACCHIAROTTO, JACOPO, an eminent painter of the early Sienese school, was born at Siena towards the end of the fifteenth century, and lived in his native town till 1535, when, in consequence of having taken a lead in a conspiracy against the government he was obliged to flee, and sought an asylum in France. He is supposed to have lived long, and to have died there; but nothing further is known of him. Several of his paintings possessed of great excellence, and both in oil and in fresco, still exist in Siena. Some of the heads and figures are said to be worthy of Raphael. Two of the greatest ornaments of the Munich Pinakothek are two small easel paintings by the same artist—the one Francesco d'Assisi, with two angels in the back-ground, and the other the Madonna and Child, with a back-ground of four angels. Few specimens of early Italian painting equal them in character, colour, and execution.

PACE, a measure of length, used as a unit for long distances. It is derived from the Latin *passus*, which was, however, a different measure, the Latin *passus* being measured from the mark of the heel of one foot to the heel of the same foot when it next touched the ground, thus stretching over two steps; while the English pace is measured from heel to heel in a single step. The Latin pace was somewhat less than 5 feet; the English military pace at the ordinary marching rate is 2½ feet, and at double quick time 3 feet. The pace is of course of little service as a unit of measure, except with disciplined troops who are always accustomed to take steps of equal length; but in this case it affords a very useful means of determining distances with tolerable accuracy.

PACHA. See PASHA.

PACHECO, FRANCISCO, a celebrated Spanish painter, born at Seville in 1571, studied in his native town, and in 1600 was appointed to paint a series of large pictures, illustrating the life of San Ramon, for the convent of the Merced. In this work one of his biographers states that he had Alonso Vasquez for collaborateur, but his other biographers make no mention of this fact. His next great works were seven large frescoes illustrating the history of Dædalus and Icarus, which he executed on the walls of a large gallery in the palace of the Duke of Alcalá. These may now be seen at Madrid, whither they were removed at the commencement of the present century. Pacheco is then said to have visited Italy, and to have remained there for two or three years studying Italian art, but not producing anything of his own. His first visit to Madrid, which he made in 1611, is said to have taken place on his way back from Italy to Seville, where he again took up his abode. The progress he had made in the meantime was indicated by a Last Judgment, which was executed after his return for the nunnery of St. Isabel in Seville. Pacheco again visited Madrid in 1623 along with Velasquez, who after being his scholar had become his son-in-law. Here he did not remain long, but soon returned to his native city. He now commenced to paint that long gallery of portraits from which we obtain a knowledge of the features of nearly all the remarkable persons of his time, among them Cervantes. He died at Seville in 1654. He is the reputed author of a treatise on painting called Arte di Pintura (Seville, 1649), a very scarce work.

PACHOMIUS, a scholar of St. Antony, was the first who introduced, instead of the free hermit life, the regular association of monks living in cloisters, having founded one of them on Tabenna, an island of the Nile, about 340 A.D., and given it a rule, though by no means one of great strictness. He was also the founder of the first nunnery, and exerted himself with so much success in the career which he had thus adopted that at his death in 348 (according to some, 360 according to others) he had the oversight of above 7000 monks and nuns.

PACHYDERMATA, the name formerly applied to the division or order of Mammalia including the Elephants, Tapirs, Hippopotamus, Rhinoceros, Swine, and Hyrax—all of which forms were distinguished by their thick skin, by their non-ruminant habits, and by their possessing more than one hoof on each leg. This classification has, however, given place to a much more convenient and more correct arrangement, in which the several forms thus collated are distributed among divisions of newer construction. Thus this old division of the Pachydermata is now obsolete, and its representatives are included in the newer order of the *Ungulata* or Hoofed Quadrupeds. The Elephants form of themselves a distinct order—the *Proboscidea*. The Rhinoceros and Tapirs are included in the division Perissodactyla of the Ungulate order. The Hippopotamus and Swine are arranged in the section Artiodactyla of the latter order; whilst the Hyrax is sometimes classified with the Rhinoceros; and in other systems has a separate order—*Hyracoidea*—to itself. See UNGULATA.

PACIFIC OCEAN (at one time called also the *South Sea*), the name given to that immense expanse of water which extends for 133° of lat. and 180° of lon., between the west coast of the North and South American continents and the east coast of Asia and Australia. It is the largest of the oceans, exceeding in compass the whole of the four continents taken together, and occupying more than a third part of the earth's area. On the west it borders on the Indian Ocean, on the north it communicates with the Arctic Ocean by Behring's Straits, on the south it is bounded by the Antarctic Ocean, and on the east it joins the Atlantic at Cape Horn. Within this enormous circumference it includes the numerous islands composing the groups of Australasia and Polynesia, the islands on the west coast of America, and those on the east and south coasts of Asia. The Pacific Ocean is divided into—1st, the North Pacific, bounded on the south by the tropic of Cancer, and comprising in the north and west the Seas of Kamtchatka and Okhotsk, the Japanese Sea, the East or North China Sea, and the Yellow Sea, and in the east the Gulf of California; 2d, the Central Pacific, stretching between the tropics, and comprehending the greater part of the numerous and beautiful insular groups known by the collective name of Polynesia; and, 3d, the Southern Pacific, or South Sea proper, extending from the the tropic of Capricorn to the Antarctic Ocean, and not diversified by many islands. The Pacific Ocean receives most of its affluents from the Asiatic continent, the principal rivers being the Amoor, Hoang-ho, and Yang-tse-kiang; whilst from South America, owing to the proximity of the Cordilleras to the coast, it receives no stream of any consequence, and from North America only the Columbia and the Rio Colorado. The islands of this ocean are so numerous that it is difficult to give an enumeration of them, even in groups. Commencing on the American coast at the Strait of Magellan, and proceeding north, an uninterrupted chain lines the shores of Chili, and terminates in the large island of Chiloe. We have afterwards a long stretch of coast along which many islets occur, but we reach

the equator before meeting with any group deserving of notice. That group is the Galapagos, directly under the equator, and about 700 miles west from the mainland. Another very long stretch north, in which the Revillagigedo, Alijos, Guadalupe, and several other small groups are met with, brings us to a chain of large islands lining the coasts of British and Russian America, and containing, among others, those of Vancouver and Queen Charlotte. Turning west we have the Kodiak Archipelago at some distance off the east coast of the Peninsula of Aliaska, and the still larger chain of the Aleutian Islands, curving W.S.W. from the extremity of that peninsula, and terminating the groups of the Pacific, so far as belonging to the American continent. On the opposite continent of Asia the islands commence with the Kurile chain, stretching S.S.W. from the extremity of the Peninsula of Kamtchatka, and afterwards continued in the same direction by the far more important islands of Japan, the Philippines, and other large islands of the Indian Archipelago. In the south region of the Pacific, beyond the tropic of Capricorn, the islands are few in number, but include the important group of New Zealand. Between the tropics the principal groups are, north of the equator, the Sandwich, Ladrone or Mariana, and Caroline Islands; and south of the equator, the Marquesas, Low Archipelago, Society, Friendly, Fiji, New Caledonia, New Hebrides, and Solomon groups.

The configuration of the bottom of the Pacific Ocean is not so well known as that of the Atlantic, though much information has been gained from the voyages of the *Challenger*, *Tuscarora*, and other ships. (See OCEAN.) Owing to the vast extent of the Pacific, the operations of nature on its bosom are carried on on the most extensive scale; and the general laws by which tides, winds, and currents are regulated suffer fewer modifications than in narrow seas. The tidal wave, commencing at the equator, diverges from it towards the poles, and, proceeding with vast velocity, and without an obstruction, is scarcely perceptible among the central islands of the Pacific. Hence in the Low Archipelago, at Bow Island and Tahiti, the rise is only 1 foot, and at the Sandwich Islands 2 feet. It is only when, by the proximity of a mainland diminishing the depth of the water, or by any similar cause the natural course of the wave is changed, or obstacles to its progress are interposed, that an accumulation takes place, and high tides are formed. In the Pacific, however, these never attain the maximum heights for which some parts of the Atlantic and Indian Oceans are celebrated. In the solitary instance of Cook's Inlet, Alaska Territory, the rise is as high as 28 feet; but on all the west coast of America it is usually below 10 feet, and only in the Bay of Panama varies from 13 feet to 15 feet. For centuries this ocean, called by Magellan the Pacific, from the tranquillity of his voyage through it in comparison with the stormy sea encircling Cape Horn, was an object of dread to Europeans from its enormous extent. To traverse it was deemed a feat of distinguished daring, and its waters were for the most part navigated only to the north of the equator by the Spaniards in maintaining the communication between their colonies in Mexico and the Philippines. Since the voyages of Cook, however, and the improvements effected in the science of navigation, the Pacific has lost its terrors, and from being one of the most unknown has become one of the seas most frequently visited.

The prevailing winds of the Pacific, like those of other great seas, are divided into regular or trade winds and variables. The trade-winds of the Pacific are not so regular in their limits as those of the Atlantic, and this irregularity extends over a much wider region in the case of the south-east trade-wind than in the case of the north-east. The cause of this is the greater number of islands in the South Pacific Ocean, which, especially in the hot season, disturb the uniformity of atmospheric pressure by local condensations. The north-east trade-wind remains the whole year through within the northern hemisphere. In the middle of our summer (about July) the zone within which it blows extends from about the Mariana or Ladrone Islands, in 146° E. lon., to near the coast of North America (Lower California), and its southern limit begins to the south of the islands mentioned, in about lat. 13° N., gradually descends towards the east to about 8° N., and then rapidly rises again to about 20° N., near lon. 115° W. In winter (about January) this zone extends from Borneo and the Philippine Islands to the American coast; and its southern limit, beginning about the north-east of Borneo, keeps between 2° and 4° N. lat. until about lon. 170° W., when it gradually rises to about 10° N. lat., at about 100° W. lon. The south-east trade-wind, on the other hand, advances beyond the equator, both in summer and winter, still preserving its original direction; in summer (July) to about 7° or 8° N. lat., and in winter (January) to about 5° N. lat., at 160° W. lon. In our summer the zone of this trade-wind extends from New Guinea and Australia to the neighbourhood of the South American coast; and its southern limit, beginning off the coast of Australia, about lat. 24° S., gradually rises to about lat. 16° S., at lon. 130° W., and then sinks again to about lat. 24° S., off the coast of South America. In winter, on the other hand, the western limit of the south-east trade-wind is about lon. 175° W.; and its southern limit, commencing there about the equator, sinks gradually till it touches the Marquesas Islands, and then more rapidly till it reaches about 33° S. lat., off the South American coast. In the region lying to the west of this zone, and stretching from New Guinea and the Solomon Islands south-eastwards, there are no regular winds. West winds, accompanied by rains, here alternate with calms. Sometimes also irregular warm, moist winds reach this region from the north, but the regular north-east trade-wind never visits it. The zones of the two trade-winds are separated by regions of calms and of light-winds, the limits of which vary of course with the varying limits of these zones. In the Chinese seas the terrible typhoon occasionally rages, and may occur at any season of the year. In navigating the Pacific a knowledge of its currents is likewise of great importance. See CURRENTS and Pl. LVI.–LVII.

The Portuguese were the first Europeans who entered the Pacific, which they did from the east. Balboa, in 1513, discovered it from the summit of the mountains which traverse the Isthmus of Darien. Magellan sailed across it from east to west in 1520–21. Drake, Tasman, Behring, Anson, Byron, Bougainville, Cook, Vancouver, Lapérouse, and others, traversed it in different directions in the seventeenth and eighteenth centuries. D'Entrecasteaux, Krusenstern, Beechey, Sir J. Ross, &c., deserve notice among its more modern navigators.—See Burney's Chronological History of Discoveries in the South Sea.

PACKET BOAT is the name given to a vessel employed in conveying passengers, goods, and letters across the sea, and to maintain a regular transit between the harbours allotted to it for this purpose. Formerly quick sailing vessels, often armed, were usually employed for this purpose, but these have now been supplanted by steamers.

PACKFONG, a Chinese copper alloy of a silver-white colour. Different accounts are given of its composition. According to some it consists of arsenic and copper, according to others of copper, zinc, and

iron; zinc, copper, nickel, and iron; or zinc, copper, and nickel without iron. Others make it consist of iron, lead, and bismuth, without copper. It was formerly used to a great extent in this country by watch-makers, mathematical instrument makers, and others, for a variety of purposes for which European nickel alloys are now employed.

PACK-HORSE, a horse used to carry burdens, which are either slung across its back or packed in panniers which hang down at the sides. In the former case the burdens rest on a framework which slopes down on both sides from a ridge above the middle of the horse's back, and has the effect of distributing more equally the weight of the burden. Padding underneath the framework prevents it from injuring the horse. Pack-horses are used in great numbers to carry an army's baggage, and in mountainous countries are often used for carrying merchandise, although for this purpose mules are more commonly used.

PACO. See LLAMA.

PACTOLUS, in ancient times the name of a small river of Lydia, celebrated for its golden sand. It rose on the north side of Mount Tmolus, and after flowing by Sardis, emptied into the Hermus. It is now called *Sarabat*.

PACTUM ILLICITUM, a phrase used in Scotch law to designate an unlawful contract, whether it be directly illegal, *contra bonos mores*, or inconsistent with the principles of sound policy. No such contract can be enforced, but where its terms have been fulfilled a distinction is made between the case in which there is turpitude in both parties to the contract and that in which there is turpitude only on one side. In the former case matters are allowed to stand as they are, the law interfering on behalf of neither party; but in the latter case the duped party may bring an action for restitution of that which has been given *ob turpem causam*, even although his part of the contract may not have been fulfilled. In most cases, however, there is necessarily turpitude on both sides, and no action for restitution is competent to either party. A *pactum de quota litis*, by which an advocate, agent, or attorney agrees to accept a portion of the subject of a suit from his client as his fee, is an example of those contracts which come under the head of *pacta illicita*. Such an agreement is accordingly void. The law of England with regard to illegal contracts is similar to that of Scotland, but in English law the phrase *pactum illicitum* is unknown.

PACUVIUS, MARCUS, one of the oldest Roman tragic poets, and sister's son to Ennius, was born at Brundusium about B.C. 220, and is said to have died at his native place, in the ninetieth year of his age, B.C. 130. He is believed to have been brought up at Brundusium, but the greater part of his life was passed at Rome, where he was still living in his eightieth year. He was an artist as well as a tragedian, and a painting of his of Hercules in the Forum Boarium was much praised by the Romans. His tragedies, most of which he formed on Greek models, more especially on Sophocles and Euripides, though with greater freedom than his predecessors, were marked, notwithstanding all the defects of a language not yet completely formed, by vigour of expression, elevation of thought, and a happy selection of characters. Some of his tragedies belong to the class called Prætextatæ, in which the subjects were taken from native sources. The most famous of all his pieces was the Dulorestes, borrowed from the Iphigenia in Tauris of Euripides. Antiquity also ascribed to him the Saturæ, or poetical Quodlibets. The existing fragments of his works have been published by Bothe in his Fragmenta, and Ribbeck in his Reliquiæ Poetarum Latinorum Scenicorum.

PADANG, a town in Sumatra, on the west coast, in the province and at the mouth of a river of the same name. It is the governor's residence, and has a trade in pepper, camphor, benzoin, and gold. Some of the inhabitants are excellent goldsmiths. Pop. about 10,000.—The province or residency of Padang has a population of 1,626,408.

PADDLE, a kind of oar used by the natives of India, Africa, and America, and by most savages. It is shorter and broader in the blade than the common oar, and is used without any fulcrum on the edge of the boat. The boatmen sit with their faces looking in the direction in which the boat moves, and propel the boat by dipping the blade of the paddle in the water and pushing backwards. When there is only one boatman a double paddle is commonly used, that is, a paddle with two blades connected by a common handle. Each blade is dipped into the water alternately, first on the one side and then on the other side of the boat.

PADDLEFISH (*Spatularia*), the name of a genus of fishes belonging to the order of Ganoid fishes, and forming the type of the family *Spatularidæ*. These fishes are nearly allied to the Sturgeons, and resemble them in general form and appearance. The skin, however, is destitute of the ganoid plates or scales seen in other fishes of the order. The spine is not ossified, but is represented by a notochord. The snout is elongated and flattened from above downwards, so as to form a broad plate-like structure, which sometimes attains a length equalling that of the body itself. The gill-apertures are of large size, the gill-covers or opercula being prolonged backwards to nearly the middle of the body. The mouth is large, and provided with teeth in the young state; the teeth disappearing as the fish grows older. The paddlefishes are exclusively North American in their distribution, being found in the great rivers of that continent. The *Spatularia Folium* of the Mississippi is a familiar species, and was that first described. The fossil genus *Chondrosteus* of the Lias rocks has been regarded as being most nearly allied to the existent paddlefishes.

PADDLE-WHEEL, a circular framework of bars of iron and flat boards or vanes turned by the engine of a steam-ship, for the ship's propulsion through the water. The vanes dip below the water-surface during a certain part of the time of every revolution, pressing forcibly on the water as they are turned, and more forcibly the faster they move, because the only resistances to their motion which exist are those due to friction and the inertia of the water, which will not suddenly assume the velocity of the float. It is this resistance to motion of the floats which forces the vessel onward. This will be readily understood when it is considered that the wheel has a regular motion with respect to the ship; now a vane or float of the wheel is stopped in its motion by the water, that is, it has very little motion relatively to the water, whereas its motion relative to the ship is unchanged, hence the ship must move relatively to the water. In producing resistance to the motion of a float, a small motion must be given to the water, and this is less as the floats are made larger, and as they move with greater velocities. Thus the float moves backwards a short distance with respect to the general mass of water, and hence the ship need not move so far forwards as before to maintain its proper motion in relation to the float. The velocity of this backward motion of the floats is called the *slip* of the paddle-wheel, and it is evidently equal to the difference between the velocities of the float with respect to the vessel, and of the vessel with respect to the water. *Feathering paddles* have floats which keep a nearly vertical position while immersed. To

enable them to do so they are attached to the rim of the wheel by pins, which allow them to change the angles which they make with the radii during immersion. Each float has an arm or 'stem' which is attached to an eccentric ring on the ship's side, near the middle of the wheel. If the float of a feathering paddle-wheel is detached in a rough sea it is very easy to replace it. When a float is always directed to the centre of the wheel, the normal to its surface is parallel to the direction of motion of the vessel only when in its lowest position, and it enters and leaves the water at a very acute angle with the water-surface. This is the case of 'radial floats.' Now fluid pressure on a float is normal, so that part of this pressure is so communicated as to raise or lower the vessel. It is for this reason that radial paddles are never deeply immersed. When the immersion is small the slip is great, so that these floats slip considerably even when made very long. The usual radius is two to two and a half times the greatest immersion of a float when the vessel is loaded, and one float is usually provided for every foot in diameter of the wheel, so that they are more than 3 feet asunder. To roughly approximate to the mathematical curve proper for a float which would enter and leave the water without producing foam, radial floats are usually formed in two halves, the lower being placed on the 'after,' and the upper on the 'fore' part of the paddle-wheel arm, an expedient which has led to good results. The common radial wheel is lighter than the feathering paddle, is less easily hurt, and does not need such good workmanship. For these reasons many people still recommend the radial wheel for large steamers, particularly when these are designed for long voyages or for foreign stations, where workmanship is expensive. Feathering paddles are much more efficient, however, and particularly so when there is a variable immersion.

PADELLA (Italian, literally a frying-pan, from the Latin *patella*, a small flat dish or plate), a shallow vessel used in illuminations. A number of them are partially filled with some kind of grease, in the middle of which is placed a wick, and are then placed so as to bring out when lighted the outlines of a building or the slope of a rising ground. The idea of illuminating in this way originated, as the name indicates, in Italy, where padelle are frequently used to illuminate St. Peter's and other large buildings; but it has been carried out with fine effect on more than one occasion at Edinburgh.

PADERBORN, formerly an imperial bishopric, in the circle of Westphalia, was attached in 1802 to Prussia, in 1806 to the Kingdom of Westphalia, on the dissolution of which in 1813 it was restored to Prussia. The town of Paderborn, formerly the capital of the bishopric, is situated in the Prussian province of Westphalia, at the sources of the Pader, 50 miles south-east of Münster. It is an old and gloomy town, with narrow streets, and houses in the antique style. It is the see of a Roman Catholic bishop, and has a fine old cathedral. At the west end there is a tall and massive tower which, as well as the crypt, belongs to the eleventh century—both in the Romanesque style; the body of the church, 345 feet long, is of the twelfth century. The manufactures are flour, starch, oil, beer, and tobacco, and it has a considerable cattle, wool, and general trade. It was at one time a member of the Hanseatic League. The ground on which it stands teems with springs, some of them warm. The university which formerly existed at this place was suppressed in 1819. Pop. (1880), 14,689.

PADIHAM, a town in Lancashire, England, 4 miles west of Burnley, on the right bank of the Calder. It has some manufactures of cotton and iron, and brass-founding is carried on. There are also coal-mines and stone-quarries in the neighbourhood. Pop. in 1881, 8983.

PADILLA, Juan Lopez de, a Spanish warrior, was sprung from a noble family in Toledo, and shortly before the outbreak of the insurrection of the Castilian towns (the so-called Communidades) was appointed by Charles V. in 1518 military commander in Saragossa. When the insurgents flew to arms the Santa Junta intrusted him with the command of the forces of the communeros. After several successes he was induced to accept the offer of battle given him by the royal army at Villalar in 1521. The loss of this battle decided the fate of Castile as well as his own. After a heroic resistance he was wounded, taken prisoner, and was executed on the following day (April 24, 1521). The two letters in which shortly before his execution he took leave of the town of Toledo and of his wife Maria Pacheco, have become famous as models of magnanimous feeling and touching simplicity. Both he and his widow, who defended Toledo for some time after his death, and on its fall fled to Portugal, have become the subject of numerous dramas and poems, so that their names are still household words among the Castilians.

PADISHAH, a title assumed by the Turkish Sultan, derived from *pad* (protector or throne), and *shah* (king, prince). As a title of foreign princes the Ottoman Porte formerly applied this name only to the King of France, calling the other European sovereigns *kral;* but it has since been applied to other leading sovereigns of Europe.

PADUA (Italian, *Padova*), a province in Italy, in the department (*compartimento territoriale*) of Venezia; area, 854 square miles. It is divided into eight districts. The chief rivers are the Brenta and Bacchiglione, with the Adige forming its southern boundary. It is fertile, and produces maize and rice, besides the ordinary cereals; wine, excellent fruits, silk, hemp, and flax. Pop. (1881), 397,833.

PADUA (Italian, *Padova;* Latin, *Patavium*), a town in Italy, capital of the province of the same name, and 22 miles west of Venice, on a low flat on the Bacchiglione. It is surrounded by a lofty wall, flanked with bastions, and by a wide, though shallow ditch, which is kept dry, but can be filled with water. It is connected by canals with the Adige and the lagoons of the Adriatic. The loftiness of the houses, combined with the narrowness of the streets, give it a dark and disagreeable appearance, and it has the additional disadvantages of uncleanliness and bad pavement. The streets and squares are usually lined with colonnades. The largest and finest of the piazzas is the Piazza Vittorio Emanuele, formerly called the Prato della Valle, which is well planted with trees, surrounded by a running stream, and adorned with numerous statues of distinguished townsmen and other Italians. The buildings most deserving of notice are the town-house or Palazzo della Ragione, an immense pile extending along the market-place, erected between 1172 and 1219, and remodelled in 1420, standing upon open arches, with a lofty roof, said to be the largest in the world unsupported by pillars, and containing a large hall, adorned with fine mural paintings, about 400 in number; the Duomo or cathedral, which dates from the latter half of the tenth century, possesses a fine library, rich in rare books and manuscripts, and of which Petrarch, who was canon of the cathedral, is reckoned one of the founders; the baptistery of the cathedral, a fine Lombard building of the twelfth century, whose walls and cupola are entirely covered with frescoes; the church of St. Anthony, a huge structure, bearing a considerable resemblance to a Moslem mosque. The

most famous establishment in Padua is the university, one of the most ancient in Europe, said to have been founded early in the thirteenth century by the Emperor Frederick II., but according to other accounts not founded till 1270, and sanctioned by Pope Urban IV. in 1263. It was long renowned as the chief seat of law and medicine, and is celebrated for its professors, among whom are included Galileo, Guglielmini, and Fallopius, and still more so for its students, including Dante, Petrarch, and Tasso. In connection with the university is a botanic garden, the oldest in Europe, containing some of the earliest specimens of trees and plants once rare, but now generally diffused; a library of 120,000 volumes, and an observatory. With the exception of the manufacture of silk fabrics, ribbons, and catgut, the industries of Padua are unimportant; but its trade in cereals, oils, wines, and cattle is considerable. Padua is the see of a bishop and the seat of several superior courts and public offices. It claims to have been founded shortly after the destruction of Troy by the Trojan Antenor. Under the Romans it became a flourishing municipal town, but on the decline of the empire was sacked, first by Alaric and then by Attila. Its great modern restorer was Charlemagne, under whose successors it successfully asserted its independence. In 1318 it fell under the domination of the Carrara family, and in 1405 under that of Venice, whose fortunes it has since followed. Among the distinguished men to whom Padua has given birth are the historian Livy, Sperone Speroni, a writer of tragedies in the sixteenth century; the poet Cesarotti, and Donati the naturalist. Pop. (1881), 47,334.

PADUCAH, a town in the United States, in M'Cracken county, Kentucky, on the Ohio, not far from the mouth of the Tennessee. It is a rising town, with considerable trade. Pop. (1880), 8036.

PÆAN, or PÆON (Greek, *paian*, *paiōn*, 'the healing'), in Homer, the name of the physician of the gods, afterwards a surname of the gods who exercised the healing power, and particularly of Apollo and his son Æsculapius. In the hymns to Apollo the phrase *Io pæan* was frequently repeated, and hence they were also called *pæans*. They were sung in time of sickness, and on other occasions, when it was desirable to propitiate the favour of the god. Hymns to other deities, or songs in praise of heroes, were at a later period likewise called *pæans*. A pæan was sung, previous to battle, in honour of Ares (Mars), and after a victory, in praise of Apollo.

PÆDOBAPTISTS. See BAPTISTS.

PÆONY. See PEONY.

PÆSTUM (called by the Greeks *Posidonia*), an ancient Greek city of Lucania, Lower Italy, lying in a plain at the foot of Mount Alburnus, on the Sinus Pæstanus, now the Gulf of Salerno. It is celebrated by the Latin poets for the fragrance of its twice-blowing roses, and its mild and balmy air. Nothing now remains of it but some fragments of its walls and the remains of two temples of Doric architecture, of an amphitheatre, and another building. The Doric temples especially are of extreme interest. The city was settled by a Greek colony from Sybaris B.C. 524; but is thought to have existed before this date. Having been captured by the Lucanians in the following century it gradually adopted the language of the conquerors, and lost the characteristics of a Greek city. The town was destroyed by the Saracens in the ninth century. The coins of Pæstum, as well as its ruins, show it to have once enjoyed great prosperity. The ruins were discovered in the middle of the last century.

PAGANI, a town in Italy, Naples, in the province of Principato Citeriore, about 10 miles north-west of Salerno. Pop. 12,492.

PAGANINI, NICCOLÒ, the most celebrated violinist of modern times, born in 1784 at Genoa. His father, who had some knowledge of music, and discerned the talents of his son, put him at a very early age under the best masters to learn music, and particularly the violin. With this instrument his progress was so rapid that at the age of nine he was able to perform in public. In his twelfth year he went to Parma, where he was instructed in counterpoint by Rolla and Ghiretti. In 1797, in company with his father, he performed in the chief cities of Lombardy. He afterwards travelled alone over the greater part of Italy, giving concerts at various places, till at last he settled for a time at Lucca, in 1805, where he was appointed principal violinist to the court chapel. The Princess Eliza, Bonaparte's sister, who wished to fix him at Lucca, gave him the honorary rank of captain, and made him presentable at court. In 1808 he quitted Lucca, and for the next five years lived an obscure and wandering life in Italy. In 1813 he re-appeared before the world, and performed at Milan. He remained in Italy till 1828, frequently performing in the chief cities, suddenly appearing, and, after exciting unbounded enthusiasm, as suddenly departing. In the year mentioned he visited Germany, appearing first in Vienna. From this period his fame was world-wide, and though he was not particularly covetous of it, he knew well how to turn it to account. The wonder which he excited was caused not merely by the charm of his execution and his extraordinary skill, but also by his external appearance, which had something weird and even demoniacal in it. His imitation of the flageolet, and his performance of whole pieces on the G string, were particularly applauded. The same had been attempted by many others before him, but never with so much success. The Emperor of Austria appointed him his chamber virtuoso, and the King of Prussia his director of music. After visiting almost all the great towns of Germany he visited France and Great Britain. In Paris he produced an unprecedented sensation, and, as in Germany, made immense gains. He was equally successful on the other side of the Channel. He returned in 1834 to Parma, where he purchased the villa Gajona. He died at Nice in 1840. Among his compositions which have appeared in print, one of the most celebrated is the Carnival of Venice.

PAGANS, the worshippers of many gods, the heathen, who were so called by the Christians because after Christianity had become predominant in the towns, the ancient polytheistic faith still lingered in the villages (*pagi*) and country districts. In the middle ages this name was given to all who were not Jews or Christians, theirs being considered the only true religion and divine revelations; but, in more modern times, Mohammedans, who worship the one supreme God of the Jews and Christians, are not called *pagans*.

PAGE (from Greek, *paidion*, the diminutive of *pais*, a child), a youth retained in the family of a prince or great personage as an honourable servant, to attend in visits of ceremony, carry messages, bear up trains, robes, &c., and at the same time to have a genteel education. See CHIVALRY.

PAGING-MACHINE, a machine for printing consecutive numbers on the pages of a book, bank notes and cheques, railway-tickets, &c. Several machines of this kind have been invented in Britain and elsewhere, all which consist essentially of a number of revolving disks bearing the ten digits in raised figures on their circumference, with various contrivances for making the first disk describe one-tenth of a revolution after every figure is printed, for making the second disk describe one-tenth of a revolution every time the first makes a complete revolution, and so

on, as well as for supplying the figures with ink at each impression. Provision is also made for the printing of duplicate numbers by an arrangement which causes the first disk to advance only after every alternate impression, and sometimes for printing alternate numbers by an arrangement which causes the first disk to advance two-tenths of a revolution between each impression.

PAGODA, the name given to the temples of the Hindus and other heathen nations of Southern Asia. They are built of wood and stone on an open place which is adorned with obelisks, columns, and other architectural works. They are of great size and height, and embellished with great splendour. They are generally in the form of a cross, the four ends of which are of equal length, with a lofty tower-like roof divided into several compartments. The most remarkable pagodas are those of Benares, Siam, Pegu, and particularly that of Juggernauth (which see) in Orissa. In the interior of these buildings, besides altars and statues of the gods, there are many curiosities. The statues, which are likewise called *pagodas*, and which are often numerous, are usually rude images of baked earth, richly gilt, but without any kind of expression; sometimes clothed and sometimes nude; standing, or sitting with the legs crossed, and often of a colossal size. Small figures with movable heads, which are brought from the East, are also called *pagods*.

PAGURUS, the scientific name of the genus of Crustaceans to which the Hermit or Soldier Crabs belong. This genus forms the type of the family Paguridæ, and this family is in turn included in the section Anomura of the Decapodous order of Crustacea. The Anomurous Crustaceans are distinguished by the soft nature of the abdomen, which is unprotected in the Paguridæ by a shell. Hence the Hermit Crabs seek refuge and protection in the cast-off shells of whelks and other Molluscs. The hinder abdominal feet are represented; and sucker-like processes—representing the 'tail-fin' of other forms—also exist, by means of which the Hermit retains a firm hold of the whorls of his shelly abode. The carapace or shell covering the back is not of strong nature, and appears to be partly membranous in structure. One of the great claws or 'chelæ' is developed to a much greater extent than the other, and is used to close the aperture of the shell when the crab has withdrawn into his abode. These crabs may be found on every sea-coast crawling about with their shells borne on their backs. They are of a pugnacious disposition, and will engage in fierce combats with each other for the possession of a shell. The *Pagurus Bernhardus* is the Common Hermit Crab. Another species, the *P. Prideauxii*, is invariably found to carry a pretty little species of Sea Anemone (*Adamsia palliata*) on the shell. The cause of this curious association or companionship is unknown.

PAHLANPUR, a town in India, in the province of Gujerat, 12 miles east of Deesa. It is the capital of a small Mohammedan principality tributary to the Guicowar. Counterpanes of chintz are manufactured here, and take their name from the place. Population, 17,189.—The state produces wheat, rice, sugar, and cotton. The southern and western portions are very fertile, yielding three crops annually. Pop. (1881), 576,478.

PAIN. Physical pain results from particular impressions made on the extremities of the nerves transmitted to the brain. No part of the body can become the seat of any painful sensation (or indeed any sensation whatever) after the nerves connecting it with the brain have been cut, bruised, or in any way destroyed. Yet we have the power of localizing pains at the parts where the nervous influences originate: we feel pains in the arm, fingers, abdomen, &c., and do not refer all pains to the brain. Sometimes pains originating at the extremities of nerves which once terminated in a member which the sufferer has lost are involuntarily referred by him to that lost member as if it were still possessed by him. Thus a person who has lost his right arm may imagine that he feels pains in his right hand or the fingers of that hand when the nerves at the extremity of the stump of his right arm are injuriously affected. Physical pain may be produced by various causes—by injuries to the organs in which the pain is localized; by a peculiar state of the brain and nerves; or by the sympathetic affection of an organ at some distance from that which has been injured, as in the case of disease of the hip-joint, which produces pain in the knee. Pain may exist without there being any physical alteration in the part in which it is localized; but if the pain is violent, and persists for a considerable time, it may bring about a degree of muscular tension which will result in excessive nervous irritation and a febrile condition of the patient. Pain affects the sufferer in an infinite number of ways, according to the tissue in which it originates, and according to individual circumstances. Hence different pains are characterized as dull, sharp, beating, shooting, piercing, gnawing, biting, stabbing, and by a number of other words which have no need of explanation. Pain is often of great service in aiding the physician at arriving at a correct diagnosis of a disease, and still more obviously in frequently being the only intimation which a patient has of the fact of there being a disease which demands a remedy. It may be remarked, however, that the degree of pain is rarely in direct proportion to the gravity of a disease, and is often altogether absent when there are other symptoms of a serious malady. It is difficult to prescribe any remedy for pain apart from the disease by which it is produced, yet in many diseases in which the intensity of the accompanying pain is such as to complicate the stages of the disease in a serious manner, incontestable advantages are derived from the use of narcotic drugs, especially opium and its preparations, to alleviate or remove the pain.

PAINE, Thomas, a celebrated political and deistical writer, was born in 1737 at Thetford in Norfolk, where his father, a Quaker, was a staymaker. The abilities which he displayed in a pamphlet written to show the propriety of advancing the salaries of excisemen struck one of the commissioners, who gave him a letter of introduction to Dr. Franklin, then in London. The latter recommended him to go to America. He took his advice, and, reaching Philadelphia in 1774, in the following January became editor of the Pennsylvania Magazine, which he conducted with considerable ability. Hostilities having commenced between the mother country and the colonies, he composed his celebrated pamphlet entitled Common Sense, which was written with great vigour. The object of this tract was to recommend the separation of the colonies from Great Britain. For this production the legislature of Pennsylvania voted him £500. In April, 1777, he received the office of secretary to the committee for foreign affairs. While in this office he published a series of political appeals, which he denominated the Crisis. He was obliged to resign his secretaryship in January, 1779, being accused of divulging some official secrets in a controversy with Silas Deane, whom he accused of a fraudulent attempt to profit by his agency in conveying the secret supplies of stores from France. But in the following November Pennsylvania testified her approbation of his conduct on this occasion by appointing him clerk to the Assembly. In 1785, on the rejection of a motion to appoint him historiographer to the United States, he received from Con-

gress a donation of $3000. He also received 500 acres of land from the state of New York. In 1787 he embarked for Europe. On the appearance of Burke's Reflections on the French Revolution he wrote the first part of his Rights of Man in answer to that celebrated work. The second part was published early in 1792, and on the 21st of May in that year a proclamation was issued against wicked and seditious publications, alluding to but not naming the Rights of Man. On the same day the attorney-general commenced a prosecution against Paine as the author of that work. While the trial was pending he was chosen member of the national convention for the department of Calais, and, making his escape, he set off for France, and arrived there in September, 1792. On the trial of Louis XVI. he voted against the sentence of death, proposing his imprisonment during the war and his banishment afterwards. This conduct offended the Jacobins, and towards the close of 1793 he was excluded from the convention on the ground of his being a foreigner (though he had been naturalized), and immediately after he was arrested and committed to the Luxembourg. Just before his confinement he had finished the first part of his work against revelation, entitled the Age of Reason, being an Investigation of True and Fabulous Theology; and having confided it to the care of his friend Joel Barlow, it was published in London and Paris in 1794, by which step he forfeited the countenance of the greater part of his American connections. On the fall of Robespierre he was released, and in 1795 published at Paris the second part of his Age of Reason; and in May, 1796, addressed to the Council of Five Hundred a work entitled the Decline and Fall of the System of Finance in England, and also published his pamphlet entitled Agrarian Justice. A third part of the Age of Reason was published in 1807. Fearful of being captured by British cruisers, he remained in France till August, 1802, when he embarked for America, and reached Baltimore the following October. He died on the 8th of June, 1809. Being refused interment in the ground of the Society of Friends, which favour he had requested before his death, he was buried on his own farm. His remains were brought to England by William Cobbett in 1819. The strong part taken by this extraordinary man in religion and politics has produced such extremes of praise and execration that there exist few or no sources of unbiassed information either as to his abilities or character except his writings. That he possessed much native vigour of intellect is indisputable, and concentrated as it became by resolute exclusion of multifarious acquirement, and of even a moderate recourse to books, it assumed in his writings that piquancy, force, and simplicity, which, of all qualities, secure the largest share of general attention in popular controversy. The political pamphlets, letters, and addresses of Paine are numerous, and may be found in the collective editions of his works. They are also enumerated at the end of his Life by Sherwin. See his Life by William Cobbett (1796), Cheetham (New York, 1809), Sherwin (1819), and Vale (1842).

PAINS AND PENALTIES, the name given to a bill brought before Parliament with the view of providing for the infliction of certain punishments beyond or contrary to the common law upon particular individuals, as in the case of attainders passed upon persons guilty of treason or felony. Such bills, when accepted by Parliament, are in fact new laws, although they have only a special application. They differ from other laws, however, in this respect, that the persons affected by them have the right allowed them of being heard in person or by council at the bar of the house.

PAINTER'S COLIC. See COLIC.

PAINTING is the art of representing objects upon a plane surface by means of colours applied in accordance with the principles of light and shade, of linear perspective and aerial perspective, with strict regard to accuracy of form, so as to produce the appearance of relief or roundness, projection and retirement of parts. According to the materials employed in the practice of the art, it is called respectively oil-painting, painting in water-colours, fresco-painting, painting in distemper, encaustic painting, painting on glass, on porcelain, and in enamel. Considered in relation to the subjects treated, the art is divided into the following branches: historical painting; portrait-painting; *genre* painting, or the representation of scenes of common or domestic life; landscape-painting, including sea-pieces; animal painting; painting of architectural subjects; painting of flowers, fruit, and still life; ornamental painting. Historical painting is at once the noblest and most comprehensive of all these, treating as it does of subjects which presuppose an exalted ideal conception. It includes the representation of great civil, political, and warlike events in the histories of nations; in sacred subjects it has reached its highest development.

Processes employed in Painting.—In giving a short technical account of the processes usually followed in painting, reference for the most part will be had to oil-painting, because of its having occupied by far the most important position in the practice of the art since the beginning of the fifteenth century. It is not to be denied, however, that water-colour painting has assumed a very high place in the present day, the works of not a few modern British artists exhibiting a degree of force and richness of colour little inferior to oil-painting.

Until the end of the fourteenth century the vehicle generally employed in mixing the colours of the painter was size, varied by a combination of gum and white of egg, the paintings being executed in a manner similar to what is now called distemper. The introduction of oil-painting has usually been attributed to Jan Van Eyck of Bruges (circ. 1380–1441). But painting with oil colours is known to have been practised long before the time of Van Eyck, as proved by the clear description of the process contained in a treatise entitled Diversarum Artium Schedula, written by the German monk Theophilus about the close of the eleventh century. From the little that can now be certainly known of this matter it seems probable that prior to the time of Van Eyck painters used either a non-drying oil, or a drying oil in its crude state, and that the 'invention' of Van Eyck, which effected so great a revolution in oil-painting, was the discovery of a drying 'vehicle,' perhaps varnish, wherewith to mix or 'thin' his colours. The means given by this new method of painting for so much greater facility and rapidity of execution, and the superior force, brilliancy, and finish attainable by it, as exhibited in the pictures by Van Eyck and his immediate followers, is sufficient to account for the great impetus given to oil-painting from that period.

All the earliest oil pictures were painted upon wood panels. Various kinds of wood were selected for this purpose, but oak, as being most durable, was ultimately used almost exclusively. All smooth or flat surfaces can be used for oil-painting, and metal has been frequently chosen by painters to secure permanence for their works; pictures painted upon copper, necessarily small in size, are yet to be found. In the early part of the present century panels made of *papier mâché* were much used for small pictures, but are now abandoned. Canvas was introduced very early as a substitute for wood panels, and has

now for many years been used almost exclusively. Its lightness and durability, and the comparative ease with which paintings can be relined or transferred to fresh canvases, render its use preferable to all other substances. All surfaces for oil-painting are *primed* or prepared. This is usually done with oil-size mixed with paint. The colour of the priming is now generally a light drab approaching white. The old masters had their canvases or panels frequently coloured a dull red or brown. This kind of preparation gave richness of tone to the picture, but was apt to deprive it of light.

The means by which the painter works out his conceptions are simple enough. Charcoal is used for rough sketching, black or red chalks or crayons, and black-lead pencils for perfecting outlines when desirable. Brushes of various sizes are employed, the larger made of hog's hair, and the smaller, for minute work, of sable or polecat hair. The palette, round the edge of which the painter places his colours for use in working, is made of fine wood, thin and flat, is oval in shape, with an orifice at the narrower end through which he passes the thumb of his left hand, the forefinger and thumb alone being sufficient to hold the palette, leaving the other three fingers free to hold the maul-stick or mahl-stick, which is needed in painting large pictures. This instrument, on which the painter rests his right hand when at work on his picture, is a thin light rod varying from 3 feet in length upwards, the upper end being covered with a spherical cushion of cotton wool covered with white leather. The colours are spread and mixed on the middle of the palette with a thin spatula or palette-knife. The canvas, stretched on a stout wooden frame, is placed in the easel, a tall frame of wood composed of two flat front pieces inclined outwards laterally from the top, and a back piece hinged to the cross piece at top, to permit of the frame being inclined slightly backwards. The front pieces are pierced with a succession of holes at regular distances to receive pins, on which a flat piece of wood is placed across the easel to support the picture. For very large pictures a mechanical contrivance is attached to the easel, for the purpose of raising or lowering them easily as required. For the historical painter the *lay figure* is a necessity. This is a human figure made of wood, with movable joints. It is chiefly used for hanging drapery upon, so disposed as to form models of folds, &c.

It is not necessary to notice fully the studies through which all art-students must pass; we shall only mention that to the historical or the *genre* painter a knowledge of the anatomy of the human figure is indispensable to complete success in his art. To the landscape-painter long and careful study of nature in all aspects, and under all *effects* of light and shade, is equally indispensable.

In endeavouring to convey to the general reader some idea of the procedure followed in designing and painting a historical picture, it must be premised that all painters have their own special modes in regard to details. No two artists mix their colours alike, or convey them to their canvas in the same order; and in preliminaries of study, sketches, commencement of painting, &c., there is a like variability. The general order of procedure can alone be indicated. To the choice of a subject, and the conception of its treatment as a whole and in detail, the true artist gives long and careful thought. It is related of the old Italian monk and painter, Fra Angelico, that he made every one of his pictures the subject of earnest prayer; assuredly no artist can ever produce a work of true excellence without the preliminary of religiously earnest thinking. His ideal being conceived he keeps it ever before him, and steadily aims at realizing it in his picture. The first steps in the work are making rough outline sketches on paper of the composition, or grouping of the figures, arranging and re-arranging their positions, and developing their action. When this is done the scheme of light and shade is considered, and sketches made of its general arrangement and connection of the several parts of the composition. Colour is the next and important matter to which the attention of the artist must be given. To determine the scheme of colour in all its relations of contrast and harmony, a small but careful sketch in oil must be made, and to this, as to grouping, arrangement, and light and shade, much study must be given, with the view of securing a harmonious unity to the whole composition. These preparatory oil sketches are not unfrequently matured and finished afterwards by the painter, and are much prized. The character and general treatment of the work having been thus far settled, the artist now proceeds to make studies of individual figures from living models. It was and is the habit of many painters to draw their figures nude, and then to clothe them, with the view of securing perfect accuracy of form in action or repose. Many extant sketches of Raphael's show that this was his practice, and not satisfied with mere sketches and studies in chalk of the entire figure, and full-sized heads, hands, and feet done in a like manner, Raphael and others of the old masters made full-sized and finished studies in oil of the principal heads in their pictures. Costume has for a considerable time been studied carefully by historical painters, and the figures in their pictures are now clothed in strict accordance with the periods in which they were supposed to have lived. Even in the accessories introduced into pictures, arms, armour, furniture, &c., a painstaking regard to time and place is now observed by painters.

All preliminaries being completed, the painter now proceeds with the picture upon which so much careful preparation has been bestowed. He roughly, but accurately, draws his outline upon the canvas with charcoal, correcting and adjusting all its parts to his satisfaction. Some artists proceed to paint at once upon this apparently slight foundation; others perfect their outline with chalk or pencil before commencing to paint. The living models are again brought into requisition for the general figure, faces, hands and feet, drapery, costume, &c.; accessories being also painted from models if attainable. Some painters finish individual parts as they proceed, others 'lay in' the whole before beginning to finish. Many artists work out their pictures with great rapidity upon the basis of the previous studies; others proceed slowly and carefully, making 'good work,' that is, careful painstaking manipulation. The historical painters in fresco and in water-colours, and the *genre* painter, have to go through a similar course of study and preparation.

It will be seen that to produce a historical picture worthy of the name is no light task; it demands not only special manipulative skill, but high and earnest thought. Painting in its highest walks requires a genius as lofty in degree as poetry, though different in kind. The historical painter, like the poet, has to tell his story, or convey his ideal of the excellent or beautiful; he has to conceive and depict the expression and action of human passion and feeling in all its varied characters and moods, and his success depends upon his choice of and true conception of his subject, and his power to give a forcible, truthful, or beautiful rendering of it in his picture; the mechanical execution of the work is altogether subsidiary to the thought conveyed in it. The landscape-painter, if not a mere transcriber to his canvas of 'bits' of nature, must also be possessed of the

poetic afflatus. To excel in his art he must be an ardent and constant student of nature, possessed of a memory retentive enough to recall and depict those evanescent effects of sunlight and shadow, the exquisite colours, forms, and combinations in sky and moving water which are so beautiful, yet so transient, and to infuse into his pictures the feeling and sentiment evoked by the varied aspects of nature.

The landscape-painter in oil or water-colour, when he has to paint an actual scene or 'view,' must have a finished sketch of his subject done on the spot, from which he paints his picture; but he has besides to invest it with the effects of sunlight or gloom derived from observation and study. If his picture be a 'composition' or ideal scene, he must prepare for it by making sketches of arrangement of parts, studies of the schemes of colour and of light and shade, and studies of the different objects of which his picture is to be composed. It is rare that the painter depends solely upon his imagination or memory in executing a work of any importance.

For an account of other methods of painting, see articles FRESCO-PAINTING, DISTEMPER, ENCAUSTIC-PAINTING, ENAMELLING, GLASS-PAINTING, CRAYONS, &c.

History of Painting. — The history of painting reaches back to a very early period, and in Egypt the art is known to have been practised as early as the nineteenth century B.C. Among the Assyrians too, as proved by modern discoveries, it was very anciently practised. Though failing in most of those qualities which make painting truly a fine art, the Egyptians had carried the art of representation to considerable perfection. Art, in the true acceptation of the word, can be attributed only to the idealizing nations, who have borrowed their cultivation from the Greeks; beyond this limit we find whatever exists in the shape of paintings always calculated for a sense dull in respect to the beautiful, capable of being affected only by brilliant colours, and subject to the rules of custom and worship. With the Egyptians the art of painting was chiefly the offspring of religious wants, and stood in close yet subordinate relation to sculpture and architecture. Its most flourishing period is said to have been between 1400 B.C. and the Persian conquest of Egypt in 525 B.C. The pictures are found on the walls of temples and in rock-cut tombs, on the cases of mummies, and on rolls of papyrus. Protected by the extreme dryness of the climate, many of these pictures are in a wonderfully perfect state of preservation, the colours being still brilliant on the walls of some of the venerable monuments. They represent public events, sacrificial observances, many of the operations of every-day life, animals, &c. They display no knowledge of perspective, chiaroscuro, or composition, and were executed under a strict code of conventional rules prescribed by the priesthood, from which the artist was not allowed to deviate. The objects are represented in outline and arbitrarily coloured, men being generally painted red, women red or yellow, quadrupeds brown, birds blue and yellow, &c. The colours are simply laid on flat, without half tints and shades.

The Greeks attained a high degree of excellence in painting, as is proved by the testimony of historians, for none of their paintings have come down to us. The most celebrated of the Greek schools of painting were those of Athens, Corinth, Sicyon, and Rhodes. In Greece proper, as in Egypt, we find the art of painting originally a companion of sculpture and architecture. The cornices of the temples, the *rilievi* of the pediments, the galleries, &c., were originally painted, as were also the statues. The proper art of painting must have proceeded from drawing, which commenced with fixing the outlines of objects and their shadows. From drawings the first step was to monochromes. The next step was to paint the contours with one colour, then to represent the roundness of the body by light, shade, and gradations of colour. The most ancient remnants of this way of painting are the pictures on vases with black figures similar to *silhouettes*. This manner was continued till late. The *style*, which was used in working on coloured wax tablets, prepared skins of animals, and smoothed sections of boxwood, sufficed for linear drawing. The *polychrome*, the drawing with different colours, supposed a more artificial instrument—the brush, moved by the hand with greater ease and freedom. Among the few artists of the earliest period whose names have come down to us are Micon and Polygnotus—the former a native of Athens; the other a native of Thasos, who about 460 B.C. came to Athens. Both of them were employed in adorning the temples and porticoes of that city with pictures, whose subjects were taken from mythology. Another early painter, who flourished about 450 B.C., was Panænus, a relative (some say brother) and assistant of Phidias (490–432 B.C.) His wall pictures in the Athenæum at Elis, his pictures in the temple of Zeus at Olympia, the painting of the Pœcile, or painted porch, in Athens, with the battle of Marathon, together with his portraits of the Greek and Persian generals in several pictures, have brought his name to us. The most distinguished painters of the next generation (the time of the Peloponnesian war) were Apollodorus of Athens, Zeuxis of Heraclea, Parrhasius of Ephesus, and Timanthes of Samos. In the distribution of light and shade Apollodorus of Athens seems to have much advanced the art, whence he is called *skiagraphos* (painter of shadows). Zeuxis and Parrhasius were both remarkable for their attempts to create an ideal of female beauty. Timanthes endeavoured to attain to the full power of expression in tragic subjects. At a later age (the time of Alexander the Great) appeared the greatest of all the Greek painters, Apelles, whose instructor in the art was Pamphilus. He made some improvements in the technicalities of the art, and was highly distinguished for his portraits. His most celebrated contemporary was Protogenes. After these two the art of painting ceased to advance in Greece, and there are scarcely any subsequent artists deserving of mention. The class of subjects treated was now widened so as to include scenes of every-day life, such as those handled in what are now called *genre* pictures. The most celebrated painter of this class was Pyreicus.

Among the Romans this art awakened little interest. At an early period they knew only the paintings of the Etruscans; and Fabius, who was surnamed *Pictor*, and Pacuvius, the tragic poet, are almost the only Roman painters who are mentioned before the introduction of Greek art, after the capture of Corinth by Mummius (146 B.C.) Even after this date, down to the time of Augustus, the chief artists who flourished in Italy were natives of Greece, and it was only in the first three centuries of our era that the principal works of Roman art were produced. A number of specimens of ancient paintings have been discovered in the tombs and baths of Rome, at Pompeii, and other places of Italy, which consist chiefly of fresco-paintings and mosaic work. No works of the older and most celebrated masters, however, remain, and consequently the inquirer must often be satisfied with mere conjectures, assisted by comparison with the works of these nations in other arts, and by the testimony of classic authors. Yet learned archæologists seem to acknowledge universally that the art of painting in antiquity always remained behind sculpture, as well in respect to

the degree of its employment as of its perfection. In consequence of a number of causes, both intellectual and physical, sculpture was more cultivated with the Greeks; and painting was influenced by this circumstance. The form, even in painting, predominated over the charm of colouring and the expression which it conveys. The contour and the local colours seem to have been perfected in a great degree; the perspective much less. Some, indeed, have doubted whether the ancients had any knowledge of perspective; but as perspective is not to be dispensed with in any representation on a plane surface, and as the ancients were well acquainted with geometry and optics, we must suppose them to have possessed in some degree a knowledge of perspective. It is more certain that they were ignorant of *chiaroscuro*. Their art of painting, indeed, was limited chiefly to the representation of historical situations and of animals; landscape-painting remained comparatively uncultivated, because this branch depends more than the others upon the perfection of colouring and the charm of *chiaroscuro*. The most celebrated of the ancient paintings preserved to our time is the Aldobrandini Marriage (so called from having belonged to the Aldobrandini family), a work of great beauty and high excellence discovered at Rome in 1606, and now in the Borghese Gallery at Rome.

The art of painting at first received a check from the introduction of Christianity. The early Christians entertained so great an abhorrence of the polytheistic systems of Greece and Rome that they discouraged the arts by which the Greek and Roman gods were represented. Even when painting did come to be practised by them, it was for a long period confined to the representation of symbols of the sacred personages, and of the rites and doctrines of the Christian faith. Thus the lamb was represented as a symbol of Christ, the fish of baptism, the cross of redemption. It was not till 692 that permission was granted by the Council of Constantinople to represent Christ in the human form, and even after this was allowed he was represented not like the gods of Greece, as adorned with all the graces of manly beauty, but as conquering the hearts of men by the power of his word, entirely unaided by personal attractions. A century later this practice was also given up by the command of Pope Adrian I., who decided that all the resources of art should be employed to impart divine beauty to the representation of the Saviour. In this way art among the Christians was prepared to enter upon a course of healthy development, but before it had got this length it had been driven out of Italy by the invasions of northern barbarians, and its chief seat transferred to Constantinople. Here the growth of the art was again retarded in the eighth and ninth centuries by the proceedings of the iconoclasts, who, in their hostility to everything that seemed to favour image-worship, made all works of art the objects of their fury. Constantinople nevertheless continued for several centuries to be the chief seat of the art. The school which flourished there is called the Byzantine school, from the ancient name of the city. It is characterized by its fondness for gilded back-grounds and bright colours, and its comparative indifference to truthfulness of representation, beauty of form, and grandeur of conception. The artists of this school, caring little for a faithful imitation of nature, were satisfied with repeating what was once acknowledged as successful, and hence certain forms introduced by some celebrated artists, and approved by the taste of the time, came to be generally held as models of the human figure. The Byzantine school was the immediate parent of the great schools of Italy, and of the Rhenish or Old Cologne school in Germany. It was not till the beginning of the thirteenth century that the art was transplanted from Constantinople to other parts of Europe. After the capture of that city by the Venetians in 1204 many Byzantine painters passed into Italy and Germany, and spread a knowledge of their art. By this time a new civilization had been created in Italy under the influence of Christianity, and the seeds planted by the Byzantine refugees found a soil fitted for their reception. In the course of three centuries, during which art went on constantly improving, painting reached in Italy a pitch of perfection such as had never before and has never since been attained. But the steps in this progress were slow. For a long time before its introduction into Italy Byzantine art had been stationary, confined to little more than a repetition of conventional forms and colours. The Italian artists did not immediately free themselves from these artificial trammels, and it was only in the fourteenth century that they succeeded in making themselves in any considerable degree independent of their Byzantine models. Giunta da Pisa, Guido da Siena, and Cimabue (born 1240) are the most important of those who helped on this emancipation; but Giotto di Bondone (1276–1336), a pupil and *protégé* of Cimabue's, was the first in whom this emancipation can be said to have been effected, and the first really great painter of modern times. He got rid of the last traces of that stiffness of form which was one of the principal heritages which his predecessors had derived from the Byzantine school. His pictures show a better idea of grouping, and are also marked by the introduction of natural incidents and expressions. He replaced the dark colour employed by the Byzantines for flesh by a paler and more natural one. His first important works belong to the beginning of the fourteenth century, and with this date begins the glory of the Florentine school of art, which maintained its pre-eminence for nearly two centuries. At the close of the century the influence of Giotto was traceable not only in Tuscany, but throughout Italy and even in more distant regions. None of his immediate successors, however, advanced much beyond the point which had been reached by him. Yet much still remained to be done. In general the pictures of this early period are distinguished more by their impressiveness of character than by the technical skill which they display. The artists looked upon themselves as coworkers with the clergy in the instruction of the people, and hence their subjects were taken almost exclusively from sacred history, and their method of treatment was distinctively religious. In the fifteenth century painting advanced very considerably, and towards the close, under the influence of the Medici, Florence shone as a capital of art with a lustre hitherto unparalleled. The changes which took place in this century were twofold. First, there was an improved knowledge of what pertained to the practice of the art, and a consequent increase of skill in execution. Pietro della Francesca (died after 1508) and Paolo Uccello (1396–7—1479) developed the science of perspective; Masolino da Panicale (1378–1415) introduced better conceptions of chiaroscuro; and Masaccio (1401–43) established a more correct standard of form for the human figure—a standard which was followed almost down to the time of Raphael. Secondly, there was a change in the class of subjects, the legends of the church and pagan mythology now beginning to be extensively drawn upon for this purpose. Fra Giovanni Angelico da Fiesole (1387–1455), who spent most of his life at Florence, was highly distinguished for his paintings of sacred subjects. He is inimitable in his represen-

tations of angels and glorified saints, but weak in expressing action or representing man in his human nature. Florentine art reached its consummation in the first half of the sixteenth century in the person of Michael Angelo (1474–1563), a painter unmatched for sublimity and grandeur. Fra Bartolommeo (Baccio della Porta, 1469–1517) and Andrea del Sarto (1488–1530) deserve especial mention among the contemporaries of Michael Angelo. The painters who came after him are many of them nothing more than weak imitators of his style. Before the middle of the century a steady decline in the art was discernible. In the latter part of the century there was indeed a fresh revival, but it was short-lived and comparatively unimportant. Almost the only notable name in connection with it is that of Carlo Dolce, a careful painter of female heads. About the middle of the seventeenth century Pietro da Cortona introduced a florid style of fresco-painting, the imitators of which were called *Machinisti*.

The Roman school may be regarded as the direct continuation of the Umbrian, a school so-called from the province within which the artists pursued their labours. The chief characteristic of this early school is its spiritual and almost ascetic style, the natural outcome of the religious enthusiasm which distinguishes the inhabitants of Umbria. In this school Pietro Vannucci (Il Perugino, 1446–1524) surpassed all his predecessors, but is chiefly famous as the teacher of Raphael, the greatest painter of the Roman school, and reckoned by many the greatest painter that the world has ever seen. Raphael died in 1520, and after his death the Roman school deteriorated. The most distinguished of his scholars for original power was Giulio Romano. Art at Rome thus reached its climax about the same period as it did at Florence and also Venice. The sack of Rome in 1527 dispersed the followers of Raphael over Italy, who carried with them a spurious style which was known as Raphaelesque. In the seventeenth century there was a revival of the Roman school under Andrea Sacchi (died 1661) and Carlo Maratti (died 1713).

The Paduan school first gained distinction through the influence of Francesco Squarcione, whose collection of drawings and casts from the antique greatly promoted the cultivation of form. His most eminent pupil was Andrea Mantegna (1431–1506), the greatest painter of Northern Italy down to the middle of the fifteenth century (with exception of Leonardo da Vinci), and the founder of the Mantuan school, which produced many of the most famous painters of Lombardy.

In Venice painting seems to have made little progress till the fifteenth century, when the Bellini, Jacopo (1405–70) and his sons Giovanni (died about 1516) and Gentile (died 1501) flourished. The most brilliant epoch of this school begins with the sixteenth century, and its brilliancy is mainly due to the genius of two men, pupils of the Bellini, Giorgione (1477–1511) and Titian (1477–1576). In the latter part of the century flourished three other painters of great repute, Jacopo Robusti (Tintoretto, 1512–94), Paolo Cagliari (Veronese, died 1588), and Jacopo da Ponte (Bassano, 1510–92); but after them Venetian art declined, and its history furnishes no other great names. The distinguishing excellence of the great Venetian painters is mastery over colour; 'it is chiefly this quality which gives the stamp of perfection to their productions; with admirable mastery they give the warmth of life to the colour of flesh, imitate the splendour and brilliancy of different materials, and, if we may venture to say so, relieve light on light; but this technical skill is in them the expression of a characteristic and elevated conception; it is the enjoyment of life and of its splendour which speaks in all the nobler productions of this school.'

The earliest great name of which the Bolognese school can boast is that of Francesco Francia (1450–1522). His influence did not last long, and it was only about 1585, when the Carracci established their Academy at Bologna, that this school rose into ascendency. The influence of this school, which was eclectic in its character, extended over all Italy. The study of nature and the imitation of the great masters were its fundamental principles. External correctness is its general characteristic, and its productions rarely bear the stamp of spontaneous and really satisfactory feeling. The greatest names belonging to it are those of Domenichino (1581–1641), Guido Reni (1575–1642), and Francesco Albani (1578–1660).

The only other Italian schools of painting are those of Milan, Parma, and Naples. The founder of the first was Leonardo da Vinci (1452–1519), a man of universal talents, almost equally celebrated as painter, sculptor, architect, and engineer. As a painter he is often spoken of as the prototype of the distinguishing qualities of Correggio, Giorgione, Titian, and Raphael, the great masters whom he immediately preceded. The chief ornament of the school of Parma was Antonio Allegri (Correggio, 1494–1534), who brought chiaroscuro and the art of relief to perfection. The school to which he belonged is characterized by extreme softness and grace, sometimes amounting, as in the productions of Francesco Mazzuoli (Il Parmigiano), to affectation. The school of Naples claims an antiquity but not an importance equal to that of Florence. No name of importance occurs until the seventeenth century, when Giuseppe Ribera (Lo Spagnoletto, 1588–1656), Salvator Rosa (1615–73), and Luca Giordano (1632–1705) flourished.

In Germany, though the art can be traced back to the time of Charlemagne, little is known of the art productions beyond missal illuminations till the thirteenth century. From the fourteenth to the fifteenth century flourished the school already mentioned as a branch of the Byzantine, namely, the Rhenish or Old Cologne school, the chief members of which were Meister Wilhelm (William of Cologne) and Meister Stephan. In Germany, as in Italy, art reached its culminating point in the first part of the sixteenth century, when Albrecht Dürer (1471–1528) reigned in Nürnberg, and Lucas Cranach (1472–1553) at the Saxon court. The principal other German artists of the time were Hans Burgkmair (died 1559) and Hans Holbein (died 1554), the latter of whom was connected by his career more with England than Germany. After this time the Germans became imitators of the Italian and Flemish eclectic schools, and from the death of Cranach scarcely any notable names occur among German artists down to the beginning of the present century.

The Flemish school dates from the beginning of the fifteenth century, when Hubert and Jan van Eyck established themselves at Bruges. To them is due the credit of discovering a drying varnish which facilitated the use of oil in painting. The best painter of this school is Hans Memling (or Hemling), who flourished during the latter half of the fifteenth century. A contemporary school existed at Antwerp, the leaders of which were Quentin Matsys (1460–1529) and Luke of Leyden (1494–1533). Under their immediate successors the true Venetian colouring was introduced, but their productions have no other importance. The golden era of this school commences with the seventeenth century, when the genius of Rubens (1577–1640), a painter full of physical energy and life, revived the glories of Florence and Venice. His pupil and successor, Vandyke

(1599–1641), is more refined and elegant than his master, and unsurpassed in portraiture. A period of decline followed his death, which lasted till the present century, when art again revived in Belgium.

The Dutch school can scarcely be separated from the Flemish till the early part of the seventeenth century, when it at once acquired a distinct individuality and European fame at the hands of Rembrandt (1606–74), whose chief merit consists in his mastery of light and shade. Its individuality was further defined by a class of painters (Breughel, Teniers, and others) who excelled as colourists, and devoted themselves almost exclusively to that branch of painting known as *genre*, and also by a school of landscape-painters (including Bril, Adrian van der Velde, Ruysdael, and Hobbema), both of these schools being contemporary with Rembrandt.

The Spanish school stands almost alone in the uniformly religious and ascetic character of its productions. The art can scarcely be said to have existed in Spain before the middle of the fifteenth century, and did not enjoy any extended reputation till the seventeenth century. Pacheco, Cano, Zurbaran, Velasquez, and Murillo, all of whom belong to that epoch, share the glory of raising Spanish art to such an eminence that it has secured admiration wherever works of art are known and appreciated. Since the beginning of the eighteenth century Spain has produced no artists of importance.

French art was derived from Italy, and was introduced in the reign of Francis I. (first half of sixteenth century) by Primaticcio and others. Simon Vouet (1582–1641), who received an Italian education under Caravaggio and the later Venetians, is the first native artist of note who laboured in France, and became the model of succeeding French artists. Nicolas Poussin (1594–1665), historical painter, Gaspar Poussin, and Claude Gelée or Lorraine, landscape-painters, and also Sébastien Bourdon, although of French birth, lived and wrought in Italy. Painting continued to flourish in France during the seventeenth century, the most eminent artists of that time being Lesueur, Lebrun, and Mignard. During the eighteenth century the art steadily deteriorated until a revival took place about the time of the French revolution. The two chief painters of the eighteenth century previous to this revival were Watteau (1684–1721) and Greuze (1725–1805). 'The courtly grace of the first, and the sentimental grace of the latter, only reflected the prevalent fashions of the day, and were insufficient elements to create a living school able in any real sense to speak to the nation at large.' Watteau is the only painter of the earlier French school who ranks high as a colourist.

English art differs from that of all other European schools in having had its origin entirely in modern times, it has no mediæval triumphs to look back to, no old masters to emulate. Until the eighteenth century art was known in England chiefly through foreigners, such as Mabuse, Holbein, Zuccaro, Rubens, Vandyke, Lely, Kneller, and others, who passed more or less of their lives in this country. What native painters there were were chiefly portrait-painters, among whom was Jamesone (1586–1644), 'the Scottish Vandyke.' The first truly great national painter was William Hogarth (1697–1764), than whom no painter was ever more original and creative. The modern art of Europe began with him as decidedly as did the modern poetry of Europe with Dante. He owed little or nothing to his predecessors or contemporaries, and his works are indeed a protest against previous styles. It is to this antagonism to existing models, especially of the Italian school, that the one great defect of his pictures—the want of the element of beauty—is no doubt owing. The other great painters of the eighteenth century, though far less original than Hogarth, display a deep feeling for beauty, and in management of colour, in light and shade, and in gracefulness of line, Sir Joshua Reynolds (1723–92) and Gainsborough (1727–88) have seldom been equalled as portrait-painters. They owed much to their foreign predecessors, and in their portraits the influence of Vandyke and Rubens in particular is distinctly visible. The landscapes of Richard Wilson (died 1782), though marked by the mannerisms of his predecessors, and defective in picturesqueness and accuracy of detail, are yet noble delineations of the larger and broader features of nature.

While the eighteenth century was the period in which the British school of painting rose to eminence, it was everywhere else a period of decline. Originality and invention were barely recognized as elements of art: prescription and tradition guided every enterprise; and it was only towards the close of the century that a revival was begun which led to the gradual emancipation of art from the trammels of precedent. In France this revival was headed by David (1748–1825), who made an energetic attempt to bring back the antique taste and to revive the study of anatomy and of true proportions, but whose chief service consists not so much in the establishment of a new school as in completely destroying the prestige and conventionalities of an old—that of Vanloo and Boucher. Yet the antique mannerism which for a time became in France a perfect mania, in consequence of the efforts of David and his followers, had at least one good result—that of completely correcting the taste of the French painters in form; and it doubtless laid the foundation of that general excellence of drawing which still characterizes French art. Géricault (1774–1829), the pupil of Guérin, David's closest follower, became the leader of a reaction against the extreme classicism of the school of David, and was the painter who liberated French art from its domination. Ingres (1781–1867), great as a historical and also as a portrait painter, united the best qualities of David with wonderful tenderness of outline and expression, and lofty poetical feeling. Delaroche (1797–1856) in his pictures has selected subjects taken mainly from later European history, and this is conspicuously the case with the works of Horace Vernet (1789–1863), the greatest master of his tools since Rubens, who has chosen his subjects from the French wars of the present century. Ary Scheffer (1795–1858), one of the most extreme of the 'romantic' as distinguished from the 'classical' school, seems to have drawn his inspiration to a considerable extent from the painters of the German revival; his earlier subjects were largely from the German poets, his later were chiefly sacred. Among the greatest of modern French colourists Delacroix (1799–1863) and Décamps (1803–66) should be mentioned, who have by French critics been compared respectively to Rubens and Rembrandt. The former has produced many large works ranging over many styles; the latter was partial to eastern scenes. Familiar incident and landscape, as in Britain, have become very popular with the most recent French artists. In scenes of domestic life Edouard Fère is almost unequalled for truth and tenderness of feeling. In the painting of animals Troyon and the Bonheurs have a high reputation. Gérôme has no superior among artists of the present day as a colourist and figure-painter. Extreme dexterity and command over the means and materials of art are now the ordinary qualifications of the painters of the French school.

In Germany one or two individual exceptions may be noted in the eighteenth century to the habit pre-

vailing among artists generally of dwelling upon mere technicalities; but there was no general advance in art till a date somewhat later than the French revival. The principal precursors of the German revival were Johann Holzer (1709–40), a Tyrolese fresco-painter, and A. J. Carstens (1754–98), a Dane who was devoted to the spirit of his art, and rose above the mere mechanical routine of his time. The first general movement among German artists against the slavish spirit of the eighteenth century took place at Rome in 1810, when the artists studying there agreed upon a general plan and laid down laws for the subjects, aim, and execution of art in the future. This movement gave rise to two schools, the one of which was that headed by Overbeck (1789–1869), who with some of his warmer admirers and disciples settled at Rome, repudiated Protestantism, adopted the costumes of the middle ages, and, disregarding the artistic excellences of the great masters of the sixteenth century in comparison with the exalted aim which inspired earlier art down to Giotto, confined themselves to the painting of religious subjects. The great lights of the second school are Cornelius, Schnorr, and Kaulbach, who selected their subjects mainly from mediæval and ancient history. The artists of this school have worked at Munich, Berlin, Dresden, Bonn, and elsewhere. Of course great differences exist between the styles of these artists and their followers; Cornelius, Schnorr, and Kaulbach have executed many large wall paintings, displaying much boldness and variety of invention, for the churches and palaces of Germany. Another important movement in the history of modern German art was made when in 1826 Wilhelm von Schadow, at first one of the disciples of Overbeck, was appointed director of the Academy at Düsseldorf, a post for which he had peculiar qualifications. A school of painters rose up there under his training distinguished in all kinds of painting, but especially in the illustration of biblical history, in *genre*, and in landscape.

In the nineteenth century English art has maintained the eminence which it reached in the eighteenth. For a while it laboured under the defect of careless modelling, due to the principle inculcated by Sir Joshua Reynolds, that individual character depends more upon general effect than upon the exact expression of peculiarities or minute discrimination of parts. Every department of British art came through his teaching to be characterized by a striving after colour and effect at the expense of all other qualities. The first evidence of progress in the nineteenth century was the gradual but general correction of this error. The English painters and the French painters at the commencement of this century were at opposite extremes of taste, represented in the works of Reynolds and David, both equally imperfect. Art required a compromise, or an amalgamation of these two tastes; and as an evidence of progress in both countries we find that such has been practically the case. Every step in either school has been so far in the right direction. Important service was rendered to the cause of art in Great Britain by the establishment of the Royal Commission of the Fine Arts in 1841, and by the competitions which the commissioners announced in 1843, 1844, and 1847, the first for cartoons, the second for fresco-painting, sculpture, &c., and the third for oil-painting.

It is in the painting of incidents of domestic life, incidents selected from works of fiction or such like, and in landscape, that British artists have won their greatest triumphs in the present century, though they can point to very successful achievements in other departments, such as portrait-painting and historical painting. No painter ranks higher than Sir David Wilkie (1785–1841) as a delineator of domestic incidents, though his sphere is somewhat circumscribed, his most successful subjects being selected from the field of Scottish peasant life. In Hogarth's pictures the moral generally stands prominently out, but in Wilkie's it is kept subordinate to the humours of the scene. With Wilkie may be classed Mulready (1786–1863), whose invention was perhaps less spontaneous, his presentment of a scene less dramatic, but who, in masterly drawing and in sweetness and brilliancy of colouring, was unequalled during the first half of the century. In the present day Thomas Faed is a worthy successor of Wilkie and Mulready. As a colourist and painter of the human form Etty (1787–1849) stands unrivalled, displaying his genius chiefly in scenes selected from mythology, though he successfully attempted also subjects more strictly historical. Some of his works rank among our greatest national treasures. In the field of historical painting strictly so called Maclise (1811–70) holds a foremost place; though defective in harmony and grace, and in management of light and shade, his works display fine invention, and his later ones especially great elevation and power. In the present day C. W. Cope, E. M. Ward, and J. R. Herbert hold the most prominent positions as historical painters. Among living painters may be mentioned Holman Hunt and John Everett Millais. Both are distinguished as colourists. The pictures of the former range over almost the whole of life, subjects being selected that appeal strongly to passion or imagination; those of the latter are pervaded by a serious and almost tragic interest, especially when sacred themes furnish the subject. In landscape, the second department of painting in which English painters of the present century have excelled, and which has been brought indeed to a higher pitch than at any previous period, the greatest name is that of Turner (1775–1851). Not only is he the greatest of English landscape-painters, but many consider him the greatest of all landscape-painters. To quote Mr. Francis Turner Palgrave: 'No landscape but his adequately renders what is the first and the last feature in all real landscapes—the sense of air, space, and light. . . . Others have rivalled him in quality of colour, others in fidelity of detail; he has failed at times from overambition of attempts, at times from obscurity of purpose; he trusted occasionally too much to facility in execution, he was led away by caprice of fancy—yet he is still the Shakspere of another and a hardly less splendid poetical kingdom. No one has penetrated so deeply into the soul of nature; no one has so surprised her in her sympathy with man; no one has so nearly represented her infinite mysteriousness, her multitudinous variety.' After the great master of landscape may be mentioned Clarkson Stanfield (1793–1867), noted for his pictures in which land and water scenery are combined, and some of them evincing high poetic feeling; and David Roberts (1796–1864), unrivalled in his delineation of architectural subjects, such as the ancient temples and monuments of Egypt or the cathedrals of the Continent. Among portrait-painters of the present century the chief place is perhaps due to Sir Thomas Lawrence (1769–1830), who possessed delicate feeling and facility in rendering the picturesque elements of the face, though his portraits are marred by mannerism. In animal-painting England can point to two names than which none rank higher in their own branch, those namely of James Ward (1770–1859) and Sir Edwin Landseer (1802–73). No artist has represented animal life in such variety of treatment, or entered with such deep and poetical sympathy into the life of his favourite subjects, as Landseer. Other names might be mentioned, but this is unnecessary here, as we have already enumerated the chief English

painters in the section on Painting and Engraving in the article ENGLAND. The British school of painting may be said to occupy a place between the schools of Italy and Holland. It wants the sublime loftiness of the former, neither is it so low or so literal as the latter; it partakes of the qualities of both, while the spirit of the land shines visibly through it, and establishes its claim to originality.

In the Dutch art of the present day the same taste prevails as formerly. Sea pieces, landscapes, scenes of common life, and still life are still the chief subjects treated by the school. Schotel and Schelfhout have distinguished themselves as landscape-painters; while Van Os, Van Stry, Ommeganck, and others, have shown themselves possessed to a greater or less extent of those qualities for which the cattle and figure painters of the seventeenth and eighteenth centuries are admired. The influence of the French school is at present paramount in Belgium, as was the classicalism introduced by David up to 1830. At that time a reaction was begun by Wappers, who was soon followed by Leys. These painters have mainly selected historical subjects of national interest. De Keyser and Gallait may be mentioned as rather later in time, the first choosing scenes of dramatic action, the second of pensive sentiment. In Italy the arts remain to this day much as they were in the eighteenth century; and Spain, too, has yet had no re-awakening.

Water-colour Painting.—In the department of water-colour painting Britain stands pre-eminent. This country is indeed that in which the art was developed, and in which it is still mainly practised. The founders of the water school were Cozens (died 1794) and Girtin (1775–1802). Water-colour painting at first consisted of a design in brown or blue-gray wash, strengthened more or less by a pen outline, and touched over in the lighter parts with a little colour. Cozens practised the art in the most primitive manner, while Girtin added washes of colour till latterly his drawings nearly reached the sober gray tints and tender tones sometimes assumed by nature under subdued light. The works of Cotman, a rather later artist, evince a tender and imaginative appreciation of nature; and in figure-drawing those of Cristall and Liverseege deserve mention. The celebrated William Blake produced some striking water-colour paintings, more remarkable, however, for their imaginative power than for drawing and execution. Those of Stothard display much grace and delicacy of feeling. Turner, great as an oil-painter, was equally great in water-colours. He worked with Girtin when young, and his earliest works are executed in the gray and brown tints alone. Gradually, however, as Mr. Ruskin states, 'the blues became mingled with delicate green and then with gold; the browns in the foreground became first more positive, and then were slightly mingled with other local colours; while the touch grew more and more refined and expressive, until it lost itself in a method of execution often too delicate for the eye to follow, rendering with a precision before unexampled both the texture and the form of every object. This style may be considered as perfectly formed about the year 1800, and it remained unchanged for twenty years.' Before this period the term *drawing* was properly applied to pictures in water colours, for they were simply drawings done by the brush instead of the pencil or chalk, with some colour 'washed' over them, and this style was to some extent continued by Prout and others; but even now, when nearly three quarters of a century has elapsed since Turner with his contemporaries and followers effected such a complete revolution in the art, the same term still clings to works which are as truly paintings as those executed in oil. Having thoroughly mastered the element of *form*, Turner proceeded to make himself master likewise of that of *colour;* and his later works exhibit water-colour painting in its highest development. Other important water-colour painters that may be mentioned are Prout and Cox. Copley Fielding (1787–1855) is said to be second only to Turner in his treatment of space and air, and has never been surpassed in rendering certain effects of mist. Prout (1783–1852) was especially remarkable for his picturesque treatment of street views and architectural subjects; David Cox (1783–1859) for his deeply poetical representations of the landscapes of his own country. The pure style of water-colour painting, which consists in using only transparent colours, and which continued to be practised by the great painters up to the middle of the present century, began about this time to give place to the system adopted by various eminent artists of introducing opaque or 'body' colours somewhat largely into their pictures, with the view of evading difficulties or of producing effects supposed to be beyond the reach of transparent colours; but the frequently too lavish use of this material seems to have of late caused a reaction and a return to a purer style, in which while the use of transparent colours is now found capable of giving all required force and richness, opaque colours are mostly confined to the making out of small light details. Among artists of the present time John F. Lewis is distinguished for scenes of oriental life, Louis Haghe for interiors with figures, W. L. Leitch for landscapes, Edward Duncan for sea pieces and coast scenes, and Birkett Foster for landscapes with rustic figures.

Principal works on painting:—Vasari's Lives of Painters, &c., with Notes by Masselli (Florence, 1838); similar works by Belloni (Rome, 1728), Passeri (Rome, 1772), and Lanzi (1792; translated into English by Th. Roscoe, London, 1847); Reynolds' Discourses on Painting, delivered before the Royal Academy (frequently published; best edition that illustrated by explanatory notes and plates by John Burnet, 1842); Burnet's Practical Treatise on Painting (1827), and Landscape Painting in Oil-Colours (1849); Opie's Lectures on Painting (1809); Lectures on Painting and Design, by B. R. Haydon (1846); Kugler's Handbuch der Geschichte der Malerei (Berlin, 1837; English, 1855; third edition, 1860); Eastlake's Materials for a History of Oil-painting (1847); Siret's Dictionnaire historique des Peintres de toutes les Écoles (Brussels, 1848); Handbook for Young Painters, by C. R. Leslie (1855); Ruskin's Modern Painters (1843–60); Crowe and Cavalcaselle's Notices of the Early Flemish Painters (1857); by the same authors, A New History of Painting in Italy from the Second to the Sixteenth Century (1864); Wornum's Epochs of Painting (1864); and Charles Blanc's Histoire des Peintres de toutes les Écoles (Paris, 1848–69).

PAINTING ON GLASS. See GLASS-PAINTING.

PAISIELLO, GIOVANNI, a celebrated singer and musician, was the son of a veterinary surgeon of Tarento in Italy, where he was born in 1741. Having early shown his musical ability, he was in 1754 put under the care of the celebrated Durante at the conservatory of St. Onofrio, where his progress was very rapid; and in 1763 his first opera (La Pupilla) was performed with great applause at the Marsigli Theatre in Bologna. From this period commenced a long career of success, which attended him at Modena, Parma, Venice, Rome, Milan, Naples, and Florence. By the year 1776 he had composed nearly fifty operas, partly serious and partly comic, the chief of which are Demetrio, Artaserse, Le virtuose ridicole, L'idolo cinese, Il Marchese di Tulipano, La Frascatana. In that year he was induced to enter the service of

Catharine II. of Russia, who settled on him a pension of 4000 rubles, with a country house and other advantages, in his capacity of musical tutor to the grand-duchess. Here he composed a great deal, both chamber music and theatrical pieces, including his best productions, La serva padrona and Il barbiere di Seviglia. In Russia he remained eight years, when he returned to Naples, visiting and making a considerable stay at Warsaw and Vienna on his way. At Vienna he composed Il Rè Teodoro, another of his best operas, and twelve symphonies for the Emperor Joseph II. After reaching Naples in 1785 he entered the service of Ferdinand IV., in which he continued till the court retired into Sicily. On the French revolution extending to Naples, Paisiello, who remained behind, received from the republican government, now established, the appointment of composer to the nation. On the restoration of the Bourbon family he fell into disgrace, but at the expiration of two years was restored to his situation (1801). Napoleon soon after sent him an invitation to come to Paris, which he accepted, but declined the directorship of the Imperial Academy, contenting himself with that of the chapel. After remaining in the French capital nearly three years, he returned to Italy, where, on the expulsion of the Bourbons, he was made chamber musician to Joseph Bonaparte, receiving at the same time from Napoleon the cordon of the Légion of Honour and a pension of 1000 francs. In this situation he continued under Murat. His operas, serious and comic, exceed seventy, besides a great variety of ballets, cantatas, and some sacred music of great merit. He died in 1816 at Naples.

PAISLEY, an important manufacturing town in Scotland, a municipal and parliamentary burgh in the county of Renfrew, on the White Cart, about 3 miles above the confluence of the united White and Black Cart with the Clyde, and 7 miles W.S.W. of Glasgow, with which it is connected by two lines of railway. It consists of an old and new town, the former on the west or left, and the latter on the east or right bank of the river, and communicating by three handsome bridges. The old town, though formerly both irregular in its form and indifferent in its appearance, has recently undergone considerable improvement. The streets of the new town, though not remarkable either for spaciousness or elegance, are in parts well built.

Public buildings.—The first place is due to the abbey, now the Abbey Church. It was founded in 1163, by Walter, son of Alan, the first of the house of the Stewarts, for a prior and twelve Cluniac monks, for whom a very liberal endowment was provided; and at the Reformation it was, with exception of Kelso, the most opulent monastery in the south of Scotland. At this time the buildings formed a magnificent pile, with an inclosure of above a mile in circuit, laid out partly in orchards and gardens, and partly as a deer park; and the church, a fine example of the early English or first pointed style, built in the form of a Latin cross, was surmounted by a lofty steeple. After the whole was secularized, the temporal lordship formed out of it was gradually subdivided and broken up; and the abbey itself, which, subsequent to the expulsion of the monks, had been converted into an almost princely residence, was, soon after the death of James, eighth Earl of Abercorn in 1787, dismantled and let out in small tenements. The church, too, shared in the dilapidation. The steeple, as well as the choir, has disappeared, and the transept is only an interesting ruin. The main body, however, consisting of a nave and two aisles, separated from it by ten massive clustered columns, has since 1860 been restored. Adjoining the south side of the nave is a quadrangle, of about 60 feet, called the cloister court, from which is an entrance to St. Mirren's Chapel or the Sounding Aisle, about 48 feet long by 24 broad, in the centre of which stands a tomb of beautiful workmanship, supposed to have been built in honour of Marjory, daughter of King Robert the Bruce. Almost all the churches are substantial and commodious buildings, but none of them is otherwise possessed of much architectural merit, with the exception, perhaps, of St. James's U.P. church, recently built on the north side of the town. The only other edifices particularly deserving of notice are the new County Buildings, the old County Buildings and prison, a quadrangular pile in the castellated style; the Town Hall, an imposing building in the classical style, erected by the munificence of the brothers Clark; the Neilson educational institution, a large massive edifice in the form of a Greek cross, and surmounted by a magnificent dome; the buildings containing the free library and museum; the observatory; the coffee-room buildings, banks, &c.

Educational institutions.—The school board consists of seven members and the ordinary officials. Besides the grammar-school, established in 1576 by a royal charter from James VI., it has under its management five principal primary schools besides a number of smaller ones. The Neilson educational institution was built by money bequeathed for the purpose by John Neilson of Netherwood, was founded in 1839 and opened in 1852, and though under government inspection is managed by its own board of directors. Besides admitting children paying fees, it provides education free for orphans and the children of poor but respectable parents. There are also a government school of design, a charity school (Hutchison's), and an industrial school. Among the literary establishments are the Philosophical Institution and various libraries.

The principal *charitable institutions* are the infirmary; a dispensary, and house of recovery; a society for the education of the deaf and dumb, and an association for the relief of the poor. There are public gardens, called the Fountain Gardens, with an elegant fountain in the centre; and a public park.

Industries.—Paisley early distinguished itself by its manufactures, and in its staples still remains unsurpassed by any town in the kingdom. Shortly after the Union, in 1707, had opened up a free-trade with England, Paisley goods, consisting chiefly of coarse checkered linen cloth, and checkered linen handkerchiefs, many of them fine and beautifully variegated, came into great demand in the English market. Other fabrics of a lighter and more fanciful kind succeeded, and about 1760 a great number of hands were employed in weaving linen gauze: silk gauze was shortly after introduced, and Spitalfields, which had almost monopolized this branch of industry, soon found itself so completely outstripped as to be obliged to relinquish the manufacture. The shawl trade was first introduced about the beginning of the present century, and though the prosperity of the other branches of manufacture prevented it for a time from attracting much attention, it continued for a long period steadily to advance; but is now in a languishing condition. About a quarter of a century ago, when this branch of manufacture was at its height, the annual value of the shawls manufactured was about £1,000,000. The shawls, chiefly in imitation of those of India, were made of silk, soft and spun, cotton and wool, either separately or in mixtures. The material was specially imported from Germany, Australia, the Levant, &c. As a staple this manufacture has now given place to that of cotton thread, for which Paisley is celebrated all over the world. Among the other manufactures of Paisley are tapestry (which has been lately intro-

duced), embroidery, different kinds of tartan cloth, and carpets. There are also large dye and print works, engineering works, soap-works, manufactories of starch, corn-flour, and chemicals; elastic web manufactory, distilleries, breweries, and shipbuilding yards, chiefly for river steamers. At Glenfield, near to Paisley, are extensive dyeing and finishing works.

Wilson, the ornithologist, and the poet Tannahill, and Prof. John Wilson (Christopher North), were natives of Paisley, which now possesses a bronze statue of the ornithologist and of the poet. Pop. in 1871 (parl. burgh), 48,257; in 1881, 55,627.

History.—Originally a town of the Damnii, and known as Wendur or White-water. During the Roman occupation it was the site of a military station, and is mentioned by Ptolemy under the name of Vanduaria, generally supposed to be the Latinized form of the British Wendur. As late as the close of the seventeenth century the lines of the Roman camp were distinctly traceable. The prætorium stood on the western extremity of Oakshaw hill, commanding a view of the lower strath of the Clyde, and the stations for the outer guards on Castlehead and Woodside. In the year 1488 James IV. erected the village of Paisley into a free burgh of barony. The charter was obtained at the solicitation of George Shaw, abbot of the convent, and in his hands was vested the sole right of appointing and depriving the provost, bailies, and other office-bearers of the burgh. This right passed to his successors, and afterwards, when the monastery had been converted into a temporal lordship, to the superiors of the lands. In 1658 the burgh succeeded in purchasing immunity from this thraldom, and obtained, among other privileges, that of electing its own municipal authorities. It is now governed by a provost, four bailies, a treasurer, and ten ordinary councillors, and sends a member to the House of Commons.

PALADIN (from Latin, *palatium*, a palace), a term originally applied to the *Comes palatii*, or Count Palatine, the official who had the superintendence of the household of the Carlovingian sovereigns, and then to the companions in arms of Charlemagne, who lived in his palace or belonged to his court. It was applied in the romances of chivalry to the semi-fabulous companions of this monarch, to the knights of the round table, and to knights-errant generally.

PALÆMON. See MELICERTA.

PALÆOGRAPHY (Gr. *palaios*, ancient, and *graphō*, to write) is the science by means of which ancient inscriptions, and the writings and figures on ancient monuments, are deciphered and explained. It is occupied accordingly with the material, the writing, the age, and the use of written monuments, and teaches the method of reading ancient writings, of placing their various parts in relation to each other, of ascertaining as far as possible the sources of each, and of exhibiting the changes which have taken place in each individual MS., as well as the alterations which various modes of writing have undergone after their separation from the common original. At an earlier period the province of palæography, as it extended generally to all that was written, was not separated from diplomacy, and hence much which relates to it is contained in the old diplomatic works of Mabillon, Maffei, Gatterer, &c. In recent times diplomacy has been regarded as a separate science, devoted more especially to authoritative written documents, dating not earlier than the fifth century, and tending to throw light on modern history. The most important works for the knowledge of Greek MSS. are Montfaucon's Palæographia Græca (Paris, 1708), and Bast's excellent Commentatio Palæographia, published along with Schäfer's edition of Gregorius Corinthius (Leipzig, 1811). In more recent times palæography, both theoretical and practical, has attracted much attention. The best works are those of J. Kopp, the first of German palæographists, of Champollion-Figeac, and of J. B. Silvestre. The work of the last is entitled Palæographie Universelle, ou Collection de Facsimiles d'Ecriture de tous les Peuples et de tous les Temps (two vols. Paris, 1839–41, with copper plates).

PALÆOLOGI, the name of the sovereigns of the last dynasty of the Byzantine Empire. The founder of the dynasty was Michael Palæologus, who in 1260 became Emperor of Nicæa, and in 1261 Emperor of Byzantium. His successors were Andronicus II. and III., John V., Andronicus IV., Emanuel II., John VI., and Constantine XI. The last fell while valiantly defending Constantinople in 1453, when besieged by Mohammed II. A branch of the Palæologi reigned in Montferrat from 1305–1533; another in the Morea from 1380–1460. After the subjugation of Greece by the Turks the Palæologi emigrated to Italy. Andrew Palæologus, a descendant of Constantine XI., resigned his claim to the Byzantine Empire to Charles VIII. of France, in which country descendants of the Palæologi are said to be still living. See BYZANTINE EMPIRE and MONTFERRAT.

PALÆONTOLOGY (Greek, *palaios*, ancient; *onta*, beings; *logos*, discourse) is the science which treats of the living beings, whether animal or vegetable, which have inhabited the globe in the successive periods of its past history. The comparison of the petrified or fossil remains of plants and animals, belonging for the most part to extinct species, has given a powerful impulse to the science of comparative anatomy, especially as applied to the animal kingdom. Through the study of the nature and affinities of extinct animals zoology has acquired greater breadth and precision, whilst a truer insight has been obtained into the natural arrangement and subdivision of the classes of animals. But the science which has profited in the highest degree from palæontology is that which investigates into the structure and mode of formation of the earth's crust. 'Geology,' remarks Professor Owen, 'seems to have left her old handmaiden mineralogy, to rest almost wholly upon her young and vigorous offspring, the science of organic remains.' Palæontology teaches us that the laws of the geographical distribution of animals have been in operation from the remotest periods of the history of organized beings; and that from the era of the deposition of the oldest stratified rocks 'the earth has been vivified by the sun's light and heat, has been fertilized by refreshing showers, and washed by tidal waves; that the ocean not only moved in orderly oscillations, regulated as now by sun and moon, but was rippled and agitated by winds and storms; that the atmosphere, besides these movements, was healthily influenced by clouds and vapours, rising, condensing, and falling in ceaseless circulation.'

The objects studied by the palæontologist are termed 'fossils' (Latin, *fossus*, dug up). These may be actual portions of animal or vegetable organisms, such as the shells of molluscs, corals, bones of vertebrate animals, or fragments of plants, which may be more or less perfectly preserved in their original condition; but the term fossil, as defined by Lyell, comprehends 'any body, or the trace of the existence of any body, whether animal or vegetable, which has been buried in the earth by natural causes,' so that the moulds or casts of shells, and the footprints of birds, batrachians, and other animals come under this category. Fossils often present by replacement the minute structure of the organism, as, for example, in the case of silicified wood, where the cells and vessels of the ligneous tissue are all converted into silex. In the same manner the compound eyes of the trilobites of

the Silurian and other palæozoic rocks have been so perfectly preserved in lime, as to admit of their structure being determined as satisfactorily as those of the eyes of modern crustaceans and insects. Oxide of iron, iron pyrites, sulphur, and other substances, as well as lime and silex, are frequently found to replace the animal and vegetable tissues.

The sedimentary, stratified, or fossiliferous rocks are classified by their mineral constitution, their superposition, and their organic remains. As a ground of classification superposition can at best show only the relative age of a stratum as compared with other beds of the same district. The more reliable test of the age of different strata is that afforded by their contained fossils. Even this is not always a conclusive test; but as a general result of united geological and palæontological researches, it has been found possible to divide the entire series of stratified deposits into a number of rock-systems or formations, each of which is defined by possessing an assemblage of organic remains which are not associated in any other formation. While such assemblages represent in a general way the life-history of a period, the lines of distinction laid down by geologists, however serviceable in guiding research, must be regarded as only arbitrary and temporary, and liable to be re-arranged as the results of investigations in wider areas of the earth's surface come to be generalized. The division of the fossiliferous rocks into periods, epochs, groups, and formations, adopted by British geologists of eminence at the present time, are tabulated in the article GEOLOGY, to which reference is also made for a comprehensive account of the present state of the science, as well as for instructive glimpses into the life-history of the various periods. It would be a grave mistake to regard that history as otherwise than imperfect. The 'imperfection of the geological record' is freely admitted by Mr. Darwin in his theory of the origin of species by natural selection. Its deficiences are due principally to our incomplete knowledge of the geology of extensive areas of the earth's surface; to denudation, or the wearing away by oceanic currents of masses of rocks deposited in the depths of the sea, and to the fact of many of the missing groups being buried beneath other deposits; whilst more than half of the superficies of the globe is hidden from us by the ocean. The palæontological is still more imperfect than the geological record. Although a considerable proportion of the remains of plants and animals have been preserved under circumstances favourable to the preservation of their intimate structure, it must be borne in mind that organic remains were, as a general rule, first exposed on the floor of the sea, tossed by its currents, and exposed to abrading and other injurious influences; and that in many instances a long period of such exposure elapsed before they were finally imbedded in the substance to which their preservation is due. On the other hand, there were plants and animals of a structure so delicate as to render it in the last degree improbable that they should be capable of resisting the destructive influences to which more robust organisms were subjected in the process of fossilization. The preservation of most of the remains of plants and animals of the primal ages is therefore to a large extent accidental. Another cause of the imperfection of the record must be ascribed to the disappearance of fossils from rocks originally fossiliferous, but in which nearly every vestige of their existence has been effaced by metamorphic action, that is to say, the subjection of the rock to a degree of heat sufficient to render it crystalline, like the mica schists and other strata of so-called azoic regions. The vast deposits of the Laurentian system in Canada, occupying an area of 200,000 square miles, and attaining a thickness of 30,000 feet of metamorphosed and crystalline strata, has yielded only one fossil, a foraminifer named *Eozoon Canadense*, the organic nature of which, however, has not escaped suspicion on the part of some geologists. Other causes of the deficiency of the palæontological record might be adduced; but enough has been stated to show that it was no part of the order of nature to record her own history in the rocks, and that any theoretical views as to the origin of species by natural selection or evolution must derive very slender support from a record so interrupted and desultory as that of the fossiliferous strata.

PALÆOTHERIUM, an extinct genus of the order of Ungulate or Hoofed Quadrupeds, forming the type of the family Palæotheridæ, which is included in the Perissodactyle section of that order. The Palæotheridæ, of which the *P. magnum* is a familiar species, occur as fossils in strata of Eocene and Miocene ages, the former period being that in which they most plentifully occurred. They were tapir-like animals, and varied in size from that of an ordinary sheep to the proportions of a horse or cow. The nose, like that of the existing tapirs, was in all probability prolonged to form a short mobile snout or rudimentary proboscis. The feet were each provided with three toes. Molar teeth were developed, the lower molars being of a double-crescentic shape. Canine teeth were also present. The dental formula shows six incisors, two canines, eight præmolars, and six molars in each jaw, making a total of forty-four teeth in all. The Palæotherium remains were at first found in scanty quantity; but Cuvier, by aid of the inductive method of applying the facts of comparative anatomy, was enabled to construct a complete representation of the extinct form, the correctness of which representation or restoration was verified by the ultimate discovery of more perfect remains. *P. magnum* is a large species. *P. curtum* averages a sheep in size. *P. crassum* is a third species, known to palæontologists, and occurs in the upper Eocene beds.

PALÆSTRA (literally, a place for wrestling), originally in Greece formed part of the gymnasium, and were afterwards places for training the athletæ who contended in the public games. There were a number of them at Athens.

PALAFOX Y MELEZ, DON JOSE DE, Duke of Saragossa, a Spanish patriot, was born of an ancient and noble family at the castle of Palafox, in 1780. He was early attached to the military establishment of the king, and in 1808 accompanied Ferdinand VII. to Bayonne as second in command of the royal guard. When the designs of Napoleon became manifest he made his escape, was proclaimed, 25th May, Captain-general of Aragon, formally declared war against the French, and organized the insurrection in that province. He defended Saragossa during two memorable sieges in 1808–9. On the capture of the city, 21st February, 1809, he was taken prisoner by the French, and confined in the château of Vincennes till 1813. He returned with Ferdinand to Spain in the following year, was confirmed in his command as Captain-general of Aragon, and appointed a member of the commission intrusted with the organization of the army. In 1820 he declared for the constitutional party, struggled to the last against absolutism, and ceased to take any part in public affairs when Ferdinand VII. was replaced by the aid of France in irresponsible power. In 1835 he addressed the cortes of Aragon in favour of Isabella. In 1836 he was created Duke of Saragossa. He died in 1847.

PALAIS-ROYAL, a celebrated resort of the Parisians, famed alike as the scene of political intrigue and the haunt of pleasure-seekers. It was

built by Richelieu, on the site of two celebrated residences, the Hôtel Mercœur and the Hôtel Rambouillet (1629–36), and bore originally the name of Palais-Cardinal. It was built at different times, and composed of various buildings separated by courts, and presented a vast and imposing appearance, but without symmetry. It was of the Doric style of architecture, and surmounted by prows, anchors, &c., to indicate the rank of Richelieu as grand-master of the marine. It contained a theatre and galleries of art, and its courts opened on a garden, and communicated by a gallery and a series of arcades. Richelieu presented it in 1636 to Louis XIII., which donation he confirmed by his will in 1642. On the death of Louis XIII. (1643) the queen regent and the royal family established themselves in the Palais-Cardinal, and from this time it bore the name of Palais-Royal. It was afterwards assigned as a residence to Henrietta Maria, widow of Charles I. of England, who inhabited it till 1661. In 1692 Louis XIV. presented it to his nephew Philippe of Orleans, duc de Chartres, on the occasion of his marriage. It had previous to this time been greatly enlarged, and a new gallery added by Mansart was superbly decorated with subjects taken from the Æneid. The regent turned the theatre constructed by Richelieu into an opera-house, and the Palais-Royal became the scene of the voluptuous gallantry of his court. The opera-house was twice burned, and on the last occasion (1781) the Duke of Chartres (Philippe Égalité) built the three galleries surrounding the garden which still exist.

The Palais-Royal consists of a principal building flanked with pavilions, which are joined by an outer wall pierced with arched gateways. The principal entrance is in the Rue St. Honoré. The central façade is in the Doric style, and is surmounted with a circular entablature. The pavilions have a ground floor of Doric and an upper floor of Ionic architecture, surmounted by a triangular entablature. The garden is a large parallelogram surrounded with galleries and numerous arcades. These galleries belonged to the plan of Richelieu, but were actually executed, as already mentioned, by Philippe Égalité, with a view to repair his fortune and increase his popularity, by turning them into shops. He built a second theatre, and a circus in the centre of the garden, which during the revolution became a club. In the galleries were installed the most famous cafés and restaurants, and magazines of all kinds. A series of central galleries, called the *galleries de bois*, afterwards replaced by the *gallerie vitrée*, was occupied first by *modistes*, and afterwards by loose women of all kinds. During the revolution the Palais-Royal was also the focus of intrigue. After the death of Égalité it was confiscated by the republican authorities. From this time it was also invaded by gamblers, and became the chief seat of gaming-houses. In the palace proper Napoleon installed the Tribunate. At the restoration it was repurchased by the Duke of Orleans. He formed the Cours de Nemours, and built the Gallerie d'Orléans. At the revolution of 1848 the Palais-Royal was again appropriated as the domain of the state, and called the Palais National. On 23d May, 1871, during the struggle between the army of Versailles and the communists it was set on fire. The left wing and part of the central pavilion were destroyed, but the galleries and the Théâtre-Français were preserved. The Palais-Royal is now greatly deserted as a promenade, and the gaming-houses have been suppressed and the public women banished. The Théâtre-Français and the Théâtre du Palais-Royal form part of the buildings of the Palais-Royal.

Désaugiers thus closes a song vividly descriptive of the Palais-Royal in its great days:—

> Jeu, spectacle, bal
> Y sont dans leurs pays natal.
> Flamand, Provençal,
> Turc, Africain, Chinois, sauvage,
> Au moindre signal
> Tout se trouve au Palais-Royal.
> Bref, séjour banal,
> Du grand, du sot, du fou, du sage;
> Le Palais-Royal
> Est le rendez-vous général.

PALANQUIN, or PALANKEEN, a sort of litter or covered carriage used in the East Indies, and borne on the shoulders of four porters, eight of whom are attached to it, and who relieve each other. It is usually provided with a bed and cushions, and a curtain, which can be dropped when the occupant is disposed to sleep.

PALATE, the name applied generally to the roof and to the superior aspect of the mouth or oral cavity towards its hinder or posterior portions. Anatomists are accustomed to speak of the *hard* and *soft* palate. The former is constituted by the palate and superior maxillary bones; the latter is the more or less mobile prolongation of the hinder part of the roof or lining membrane of the mouth which is attached to the posterior border of the hard palate. The hard palate supports the tongue when that organ is employed in tasting, in the production of articulate sounds, in mastication, and in swallowing. The membranes and tissues which cover the bones forming the hard palate are of thick conformation, and are closely bound to the surface of the bones. The tissues are thinner towards the middle line of the palate. The *palatine glands* exist in a row on each side of the hard palate, and are most numerous and of larger size as the hard palate is continued backwards to form the soft palate. The mucous membrane of the hard palate is of a whitish colour, this appearance being produced by a thick layer of epithelial cells covering the membrane.

The *soft palate* exists only in the crocodiles out of the class Mammalia. In the Cetacea it forms a muscular canal, which prolongs the hinder nostrils downwards and backwards, and is thus adapted to the breathing-process of these aquatic forms. In the ant-eaters the soft palate is nearly 8 inches in length. It consists in all of mucous membrane and muscles, and forms a semi-partition between the mouth and the hinder nostrils. In front it is attached to the hard palate. Behind it is free, and in the middle a pointed process, the *uvula*, is situated. Its upper surface, or that next the nasal passages, is convex, and is prolonged to form the floor of the nose. The lower or under surface is concave, so as to adapt it to receive the back of the tongue; and on this surface the soft palate bears a median ridge, showing the early stage of its formation, when it consists of two halves. Non-union of these halves and of those of the hard palate produce the deformity known as *cleft palate*. Mucous glands are abundantly distributed in the membrane forming the soft palate, these structures secreting the mucus which serves to lubricate the throat during the passage of food. Above these glands muscular tissue is found, and the upper surface is formed of mucous membrane of the nasal passages already alluded to. The *uvula*, depending in the middle of the soft palate, gives to the latter the appearance of a divided or double arch. This structure, the uses of which are undetermined, consists of numerous mucous glands, and a muscle known as the *azygos uvulæ*. The uvula varies in length in different subjects and at different times in the same person. Its permanent elongation gives rise to an irritant cough produced by its tickling the throat, and for the relief of this complaint its lower border is frequently excised.

In front the soft palate becomes continuous with the tongue and pharynx or back part of the mouth through two mucous and muscular folds on either side known as the *anterior* and *posterior pillars of the fauces*. The anterior arch of each side exists as a curve from the uvula to the side of the tongue. The posterior arch begins at the uvula, follows the free edge of the soft palate, and ends at the side of the pharynx. The pillars of each side separate or diverge in a triangular manner from their point of origin, and within the triangle of each side a *tonsil* is contained.

The *muscles* of the soft palate number five pairs. These are the *levatores palati*, which raise the soft palate and bring it to the horizontal position in swallowing. The *tensores palati* draw the soft palate downwards and tighten it, and their action also includes the keeping patent and open of the Eustachian tubes. The *palato-glossi* and *palato-pharyngei* muscles form the bulk of the arches of the soft palate; and the *azygos uvulæ* muscle constitutes the last structure of this description included in the soft palate. The *tonsils* or *amygdalæ* ('almond-like') are placed between the palatine arches. They afford a mucous secretion, of use in lubricating the passages. The substance of each tonsil contains numerous follicles, which open externally by twelve or fifteen openings. These follicles secrete the mucus. The tonsils are liable to inflammatory affections, and are excised for disease without leaving any bad effects. Both the hard and soft palate are supplied with blood by the descending palatine branch of the *internal maxillary artery;* and with nerves by the palatine branches of the *superior maxillary* nerve. The use of the soft palate is chiefly to close the posterior nares or nostrils, and so to prevent the escape of the food by the nose in swallowing; during which process the palate is elevated by the levator muscles from its usually dependent position to the horizontal position. In the latter position it lies upon the back of the pharynx, and so closes the nares. The *arches* of the palate assist in swallowing. The anterior arches during deglutition contract, so as to prevent the food from returning into the mouth; whilst the posterior arches contract at the sides, and so preclude the escape of food into the nose. The whole process of swallowing is performed firstly by the mass of food being brought to the back of the tongue. The lower jaw being next closed to afford a fixed point for the action of the muscles which raise the larynx, the food is sent into the elevated pharynx by the pressure of the tongue on the palate. The posterior palatine arches and soft palate prevent the escape of the food into the nose at this stage; the anterior palatine arches and tongue prevent it returning to the mouth; the *epiglottis* is shut over the upper opening of the larynx so as to prevent the food entering the windpipe; and by the action of the *constrictor* muscles of the pharynx the food is finally shot into the œsophagus or gullet, along which tube it is propelled to the stomach by the peristaltic or vermicular contraction of its muscular walls.

PALATINATE, formerly the name of two states of the German Empire, which, until 1620, were united. The name Palatinate (German, *Pfalz*) was originally given to the imperial castles dispersed over the German Empire, in which the emperors resided alternately, with a view to maintain order by their presence, and to administer justice impartially in all the provinces of the empire. The palatine or count palatine was the highest civil and judicial officer in these castles. Finally, the title was retained by only two of the territorial magnates of the empire, whose states were distinguished as the Upper and Lower Palatinate, or as the Palatinates of Bavaria and the Rhine. The Upper Palatinate was included in the circle of Bavaria, and was bounded north by the county of Baireuth, east by Bohemia, south by the county of Neuburg, west by Bavaria and the territory of Nürnberg. Its capital was Amberg. The Lower Palatinate (Palatinate of the Rhine) was contained in the electoral circle of the Rhine, and was situated on both sides of the river. It was bounded by the territories of Mainz, Katzenellenbogen, Würtemberg, Baden, Alsace, Lorraine, and Trèves. It was composed of the Palatinate proper or Electoral Palatinate on the right bank of the Rhine, one of the most fertile countries in Europe, and of the Principality of Simmern, the Duchy of Deux-Ponts (Zweibrücken), the half of the county of Sponheim, and the Principalities of Veldenz and Lautern.

The counts-palatine of the Rhine, whose original seat was Aix-la-Chapelle, were already in the eleventh century in possession of the dignity of their office, and of the lands pertaining to it, and were among the most powerful princes of the German Empire. In 1156, the Count-palatine Hermann III. having died without issue, the Emperor Frederick I. (Barbarossa) gave the Palatinate to his own half-brother Conrad of Suabia. On the death of the latter his son-in-law, Henry of Brunswick, eldest son of Henry the Lion, inherited the Palatinate. Having taken part with his brother-in-law Otto IV. against Frederick II. he was put under the ban of the empire by Frederick, who in 1215 adjudged the Palatinate to Louis, duke of Bavaria, who, however, never obtained full possession of the state. His son, Otto II., married Agnes, the daughter and heiress of Henry (1227), and thus the entire Palatinate fell into the possession of the house of Bavaria. On the death of Otto in 1253 his sons Ludwig II. and Henry reigned, at first jointly. In 1256 they made a partition, and the Palatinate of the Rhine and Upper Bavaria fell to Ludwig, and Lower Bavaria to Henry. In 1294 Louis died, leaving two sons, Rudolph (I.) and Ludwig. The former obtained the electorate, and the latter Upper Bavaria. Louis subsequently became emperor, and also acquired Lower Bavaria. He deprived his brother Rudolph, who had taken part with his rival, Frederick the Fair of Austria, of the Palatinate; but he restored it to his son Adolphus, together with that part of Bavaria afterwards called the Upper Palatinate. Rudolph's three sons (Adolphus, died 1327; Rudolph II., died 1353; and Ruprecht I., died 1393) followed each other in the sovereignty of the state. Rudolph II. acquired the counties of Neubach and Sulzbach. He concluded with the Emperor Louis in 1329 the Convention of Pavia, by which the electorate was to be exercised alternately by Bavaria and the Palatinate. Ruprecht exchanged with the Emperor Charles IV. a portion of the Upper Palatinate for the entire cession of the electoral dignity. Bavaria was accordingly excluded from the electorate. Ruprecht II., son of Adolphus, died in 1398. His son, Ruprecht III., became emperor in 1400, and died in 1410. His four sons divided his possessions among them. Louis (III.) received the Electorate and the Palatinate of the Rhine, John the Upper Palatinate, Stephen Zweibrücken and Simmern, and Otto Mosbach. The second and fourth lines soon became extinct. The first line also became extinct in 1559, with Otto Henry the Magnanimous. Frederick III. of the line of Simmern succeeded. Like Otto he embraced the Reformation; but he adhered not to the Lutheran, but to the Calvinistic party. Louis VI. succeeded in 1576, Frederick IV. in 1583, and Frederick V. in 1610. This was the unfortunate elector who was put to the ban of the empire (1619) for aspiring to the crown of Bohemia. (See GERMANY and THIRTY

YEARS' WAR.) His Electorate and estates were given in 1623 to Maximilian, duke of Bavaria. Charles Louis, son of Frederick V., recovered the Lower Palatinate by the Peace of Westphalia (1648), and a new electorate, the eighth, was created for him, with the office of high-treasurer. The Upper Palatinate and the former rank of the elector-palatine in the electoral college remained with Bavaria. He joined the league against France in 1672, and the Palatinate was devastated by Turenne in 1674. He died in 1680, and the line became extinct with his son Charles in 1685, when Philipp Wilhelm, Pfalzgraf of Neuburg, succeeded to the electorate, and re-established Catholicism. In 1689 the Palatinate was again devastated by the French. The elector died in 1690, and was succeeded by his son Johann Wilhelm, whose estates were again ravaged by the French in 1693. He obtained peaceable possession of them by the Peace of Ryswick (1697). In 1705 he established toleration. In 1706, when the elector, Maximilian II. of Bavaria, was outlawed in connection with the war of the Spanish Succession, he recovered the Upper Palatinate, with the ancient electoral dignity, but was compelled to surrender them again at the Peace of 1714. He was vicar of the empire on the death of Joseph in 1711. He died in 1716, and was succeeded by his brother Karl Philipp, on whose death in 1742, without male issue, the electorate fell to the Sulzbach line, represented by Karl Theodor. On the death in 1777 of Maximilian III. he succeeded to the Electorate of Bavaria, a portion of the estates of which, however, fell to Austria. This was accompanied by the recovery of the old electoral office of the Palatinate, and the transference of the grand-treasurership to Brunswick. Towards the close of his reign the Palatinate was conquered by the French. He died without issue in 1799, and was succeeded by Maximilian Joseph, duke of Zweibrücken. At the Peace of Lunéville (1801) he was compelled to surrender the Palatinate. The possessions on the left bank of the Rhine were annexed to France, a considerable part of the remainder was given to the Grand-duke of Baden, and the rest was distributed among other princes. At the Peace of 1814 Germany recovered her possessions on the left bank of the Rhine, and the Palatinate was redistributed among Bavaria, Baden, Hesse-Darmstadt, and Prussia. The portion belonging to Baden is included in the circles of Mannheim, Heidelberg, and Mosbach; the Darmstadt portion constitutes the provinces of Starkenburg and Rheinhessen. Bavaria received the whole of the Upper Palatinate and the portion of the Lower Palatinate, forming the Bavarian circle of Rheinpfalz. The Prussian portion was added to the Prussian province of Rheinland.

PALATINE, COUNT. See PALATINATE and COUNTY PALATINE.

PALATINE HILL, PALATIUM. See ROME.

PALEMBANG, a town of Sumatra, capital of the province of same name, on the Moesi, here called the Palembang, about 50 miles above its mouth. The town is spread out on both sides of the river and along some creeks, so that communication between the various parts must be maintained by boats. Many of the inhabitants likewise, chiefly Chinese, live constantly on the river. Palembang is the residence of the provincial authorities, and is very favourably placed for commerce, the river having a depth of 4 to 9 fathoms, and being affected by the tide. The population, consisting of natives, Arabians, Europeans, and Chinese, is estimated to amount to about 25,000.

PALENCIA, a town of Spain in Leon, capital of a province of same name, 117 miles north by west of Madrid. It is surrounded by a lofty wall on the north-east and south, and washed by the Carrion on the west; is entered by seven gates, and consists generally of broad and well-paved streets and several promenades. The chief buildings are a light and elegant Gothic cathedral, five parish churches, several convents, an academy, a picture-gallery, Episcopal palace, court-house, and very large hospital. The staple manufactures are woollens. Palencia possesses considerable historical interest. The Cid resided here in a palace which he afterwards converted into the hospital of San Lazaro; and when the Black Prince attacked the city the women so distinguished themselves by their valour that Juan I. allowed them to perpetuate the memory of it by wearing a golden band on their head-dress. Pop. 14,505.—The province of Palencia is bounded by the provinces of Santander, Burgos, Valladolid and Leon; area, 3125 square miles. It is fertile, traversed by the Carrion and other streams, and contains copper mines and abundance of chalk, gypsum, and saltpetre. Great quantities of grain are produced. Woollens are extensively manufactured and exported to the rest of the kingdom. Pop. 180,785.

PALENQUE, a village in Mexico, in the department of Chiapas, 60 miles north-east of Ciudad-Real. Near it are extensive and magnificent ruins of what is supposed to have been a large city. These ruins are the most remarkable aboriginal remains that have yet been discovered in America. They cover a large area, and consist of vast pyramidal structures of cut stone, rising in terraces and surmounted by solid stone edifices of a peculiar architecture, ornamented with figures cut in relief or formed of stucco, and abundantly covered with hieroglyphics. Most of the buildings crowning the pyramids are of one story, though some are of two, and a square tower of three at least. The principal building, which is known as the 'Palace,' is 228 feet long, 180 wide, and 25 high, with a broad projecting cornice, the pyramid on which it stands being 310 feet long, 260 broad at the base, and 40 feet high. The Palace faces the east, and has fourteen doorways on each side and eleven at the ends. It is built of cut stones cemented with a mortar of lime and sand, and had been originally faced with stucco and painted, but most of the stucco has fallen off. The piers between the door-ways are ornamented with bass-reliefs in stucco, of spirited execution, and displaying a good knowledge of the anatomy and proportions of the human figure. There are four interior courts, upon which open a great number of chambers floored with smooth solid cement. The principal court is 80 feet by 70. On each side are large slabs of stone, on which are carved in bass-relief human figures 9 or 10 feet high. The second court is as long, but not so wide. From the north side of the third court rises a tower three stories high, which contains within it another distinct tower having a stair-way that ends, strange to say, against a solid stone ceiling. There are vaults and rooms sunk in the mass of the pyramid, in which have been found vases containing human remains. Another structure crowns a pyramid of stone 110 feet high, on the slope, and so steep that it can only be ascended with difficulty. This building has solid walls except on the north side, in which are five door-ways. The front is richly ornamented with stucco, and the four piers between the door-ways are ornamented with well-executed female figures surrounded with hieroglyphics. Another remarkable structure consists of a raised terrace measuring 60 feet on the slope, with a level summit 110 feet wide, from which rises a pyramid 134 feet high on the slope, crowned with a building 50 feet long and 31 deep. This building has three door-ways, and contains three apartments. The central and largest contains a

smaller chamber within itself, in which there is a large tablet of stone sculptured with hieroglyphics and with a group of human figures apparently engaged in a solemn sacrifice. Some of the figure groups in stucco-work belonging to this edifice, according to Mr. Stephens, 'in justness of proportion and symmetry must have approached the Greek models.' There are also a number of monolithic statues among the remains. These ruins were discovered by the Spaniards in 1750, and were explored by order of the government in 1784 and 1787 by Bernasconi and Del Rio, who published an account of them in 1822; by Du Paix (1807), whose account was published in 1834–35; and by Stephens and Catherwood in 1840. See Stephens's Incidents of Travel in Central America, Chiapas, and Yucatan; and Catherwood's Views of the Ancient Monuments of Central America, Chiapas, and Yucatan.

PALERMO, a province in the north of Sicily, bounded on the north by the Tyrrhenean Sea, east by the provinces of Messina and Catania, south by Caltanisetta and Girgenti, and west by Trapani; greatest length, north-west to south-east, 66 miles; breadth, 48 miles; area, 1963 square miles. Its coast consists of a series of extensive bays and bold promontories. Its interior towards the south is traversed, east to west, by a branch of the Neptunian Mountains. The streams are numerous, but small. It is divided into four districts—Palermo, the capital; Cefalù, Corleone, and Termini Imerese. Pop. 698,622.

PALERMO (ancient *Panormus*), a seaport town, the capital of Sicily, beautifully situated on the northern shore of the island on a wide bay partly inclosed by lofty hills. Its numerous spires, domes, and towers give it a very imposing appearance when approached from the sea. It is of a rectangular shape, surrounded by walls flanked with bastions, defended by several batteries, and entered by twelve gates. It is built with considerable regularity, and is intersected at right angles by two principal streets. At the point of intersection is a large octagon called the Quattro Cantoneri (with a beautiful fountain in its centre), lined with elegant buildings in the different styles of Grecian architecture, and adorned with numerous statues. The two principal streets are opened into by a great number of others, which are both narrower and of an inferior description; but all the streets, principal and inferior, are remarkably well paved with blocks of lava, though the benefit is often lost from the filthy state in which many of them are allowed to remain. Numerous obstructions also, in the form of booths, workshops, and other projections, block up several of the thoroughfares, and make the threading of them a task both of difficulty and danger. There are not many squares in addition to the one already mentioned, but admirable places of resort are provided by the Marina and the Flora—the former a superb terrace about 80 yards wide, stretching about a mile along the bay; the latter, commencing in the east where the terrace terminates, is a magnificent public garden regularly and beautifully laid out, and adorned with statues, fountains, and rustic temples. The public edifices are numerous, but do not in general display much taste. The most important are the cathedral, the church of San Giuseppe, numerous other churches and convents; the royal palace, finely situated, and surrounded by beautiful gardens, but consisting of a large and irregular pile of buildings, among which the only great attractions are the chapel of King Roger, rich in mosaics, the picture-gallery, the armoury, and the observatory, from which Piazzi discovered the planet Ceres; the archiepiscopal palace, the mint, custom-house, public library (apparently both well arranged and much frequented); the university, in a very declining state; the barracks, arsenal, courts of justice, *monte-di-pietà*, three theatres, four hospitals, and several literary and charitable endowments. The manufactures consist chiefly of silks, cottons, oil-cloth, leather, glass, and gloves made from the byssus or beard of a species of mussel. The trade has the advantage of an excellent roadstead and harbour, and though much more limited than it ought to be considering the great natural resources of the island, is by no means unimportant, and has in recent times greatly increased. The principal articles of export are shumac, wine and spirits, fruit, sulphur, skins, oil, essences, linseed, cream of tartar, liquorice, and manna; of import—colonial produce, woollen, cotton, linen, and silk tissues, hardware, earthenware, &c. The fisheries on the coast are very productive, and give employment to numerous hands.

Palermo is the see of an archbishop, and the seat of a supreme court with jurisdiction over the whole island; of a criminal court for the province, of a commercial and several other inferior courts, and of several important public offices. Its foundation is attributed to the Phœnicians. From them it passed to the Carthaginians, who made it the capital of their Sicilian possessions and the centre of an extended commerce. The Romans obtained possession of it in B.C. 254, made it a free town, and conferred upon it many important privileges, in consequence of which it increased rapidly and became very prosperous. After the fall of the Roman Empire the Saracens became its masters, and kept possession of it till 1072, when it was taken by Roger the Norman, who founded the Kingdom of Sicily. Since then it has always continued to be the capital. It has repeatedly suffered from earthquakes. This and the other vicissitudes which it has undergone is probably the reason why so few remains of antiquity are to be found within it. Some, however, still exist in its environs, which, both on this account and their own intrinsic beauty, are in many respects more attractive than the town. During an insurrection which took place in January, 1848, the town was bombarded; and Garibaldi seized it in 1860. Population in 1872, 186,145; in 1881, 205,712.

PALES, one of the rural deities of Italy, the giver of good pasturage, and the protectress of the flocks from contagion and wild beasts. She was represented as a pastoral goddess with a staff and a crown on her head, and was worshipped sometimes under the trees, sometimes in temples. Her festival was celebrated on the same day as the anniversary of the founding of Rome (April 21). The offerings to her were milk and cakes. Some authors represent Pales as a male deity, the son of Jupiter.

PALESTINE, CANAAN, LAND OF ISRAEL, JUDEA, or HOLY LAND, a country forming part of Asiatic Turkey, on the south-west of Syria, forming part of the pashalic of Acre and Damascus, situated between lat. 31° 30′ and 33° 30′ N.; lon. 34° 30′ to 36° E.; and bounded on the north by the mountains of Lebanon, east by the Arabian Desert, south by Arabia Petræa, and west by the Mediterranean; length, north to south, about 140 miles; breadth, about 80 miles, area, nearly 10,000 square miles.

Mountains.—The surface is generally mountainous, being traversed by branches from the chain of Lebanon, one of which stretches south in a direction nearly parallel to the coast of the Mediterranean, forming the water-shed between its basin and that of the Dead Sea; while another, turning more to the east, stretches along the left side of the valley of the Jordan. The mountains, composed generally of Jura limestone or oolite, but often capped or pierced by rocks of volcanic origin, attain their greatest height, of about 10,000 feet, in Mount Hermon, where they

first become detached from the principal chain. None of the other heights exceed 3000 feet; but many of them have acquired great celebrity from the frequent notice taken of them in Holy Writ, or the wonderful events of which they have been the theatre. The most remarkable are Carmel, forming a promontory in the Mediterranean, on the south-west side of the Bay of Acre; Tabor, or the modern Jebel Tur, at the north-east extremity of the plain of Esdraelon; Ebal and Gerizim, in the valley of Samaria; Gilead and Nebo, or Pisgah, on the east side of the Jordan; and Zion, Moriah, and the Mount of Olives, in and near Jerusalem.

Plains and Valleys.—Palestine has comparatively few plains, the strata on their upheaval having broken into innumerable fragments, like the icy aiguilles of a glacier when broken up by some sudden downward bend of the ground. This has made the plains small and few, but the valleys innumerable; so that it is precisely the country which Moses describes, 'a land of hills and valleys.' That many of these have been well wooded is evident from the frequent remains of old forests, even in localities which are now verdureless. In few countries is there such endless variety of valley as to size, shape, colour, and fertility. The small plains are numerous, the large few; the maritime plains of Phœnicia and Philistia, the river-plain of Jordan, the inland plain of Esdraelon, and the mountain plain of the Bekâ, between the two Lebanons, being all that need be enumerated. These are widely different from each other, though within a small territory. The sea-plains are still peopled and tilled, and from Gaza to Beyrût marks of fruitfulness are seen. The Jordan plain is nearly a waste of sand, that river making no further impression upon the levels on each side than merely to fringe itself for some 20 yards with verdure, which, while it hides the river from the traveller looking down say from Olivet, presents the appearance of a ribbon of winding green on a yellow robe, or of a green snake rolling all its length in the centre of a long stripe of sand. The Esdraelon plain, or 'valley of Jezreel,' is a fine plain of considerable extent. Its fertility is great; and lying waste, as it does, it produces only thistles and the like, which, however, by their enormous size (12 feet high) show the richness of the soil. Except in the district of El Huleh or 'the Waters of Merom,' or in such low-lying districts as Merj-Sanur, between Samaria and Jenin, there do not appear to be what we should call bogs or marshes, though at certain seasons there are wide tracts rendered almost impassable by the overflow of streams. The heat during the greater part of the year, from April to November, dries up most of the marshes, and scorches both hill and plain. In later ages this is more especially true, as formerly the vast forests, orchards, and vineyards and olive-yards which clothed the country shut out the heat, cooled the soil, and retained the moisture. Oriental travellers are apt to overlook these circumstances, and sometimes indulge in remarks of depreciation as well as hints of doubt as to ancient fertility, which would have been considerably modified had there been the needful recollection of these facts, and the due allowance made for the greatly altered condition of the land. For, granting that sun and rain and climate have remained much as in old days, the materials for modifying and regulating and using these no longer exist.

Caves.—Palestine being a limestone country, exhibits caves in great numbers and of all varieties of size and form. The earliest mention of a cave in Scripture is in the history of Lot (Gen. xix. 30). The next is at the death of Sarah, when Abraham bought the cave Machpelah for a burying-place. This has, so far as we know, never been entered by man, but remains in all probability just as it was when the patriarchs were buried in it. The Moslems can give us no real information regarding it, for they will not enter it, dreading immediate death at the hand of Abraham's spirit, which they believe to reside in it. Caves are frequently mentioned in the books of Judges, Joshua, and Samuel, but the only one specified is that of Adullam, which has been identified with the cave of Khureitûn (the ancient Hareth), some 5 miles south of Bethlehem—a singular cave, or rather series of caves and chambers, extending for miles, to which the one entrance is an orifice not larger than a door, half-way down the almost perpendicular face of a precipice, which orifice is reached by a shelf or ledge of rock, along which one has to find his way cautiously to the cave. The interior is quite a labyrinth, with vaulted chambers remarkably dry and warm, but with no impure air. It could accommodate hundreds of men (we might almost say thousands) all hidden in these far-extending chambers. There are caves not far from that of Khureitûn, viz. at Deir-Dubban, about half-way between Jerusalem and Eleutheropolis, but these do not correspond with the scenes in David's history; though Van de Velde thinks that these western ones are David's cave, and the eastern (Khureitûn), near Tekoah, are Saul's caves or cave. That these huge caves or grottoes at Deir-Dubban were used both for hiding-places and dwelling-places, both in Jewish and Christian days, is pretty evident; but whether this is the place of the Adullam cave of David is not so plain. There were caves in Galilee also. The 'cotton cave,' or 'Kotton-Megharah,' under Jerusalem, is a wonderful cavity, extending under a large portion of the city. But though called a 'Megharah,' it is an old quarry, out of which Jerusalem was partly built, and therefore interesting, especially as the traces of the quarrymen are still visible in every recess.

Rivers.—There is but one great river in Palestine—the Jordan, one of the most tortuous of streams; always supplied with water, though often so considerably beneath the lip of its banks as to be invisible from any distance. The Jordan originates in streams that come from Lebanon and Hermon, and unite in the Waters of Merom. It falls into the Dead Sea after a course of about 70 miles direct, or 200 including windings. There are numerous streams and streamlets finding their way westward to the Mediterranean from Libanus and its prolongations or offshoots as far as the Hills of Judah. There are equally numerous streams flowing eastward from the same range into the Huleh, Sea of Galilee, Dead Sea, and Jordan. Antilibanus, sending its offshoots down the east of Jordan, and forming the Mountains of Golan, Gilead, Ammon, and Moab, is the watershed for a large tract of country between itself and the Ghor or Jordan valley. Though the rivers are in general small, yet they are not mere summer brooks as many suppose. That but few of the innumerable wadys or water-courses are filled throughout the year is true; but still there are several permanent streams which do good service in the districts through which they pass. Passing by what we may call 'Lebanon streams,' which are always vigorous, there is the Zerka, a few miles north of Cæsarea; the Aujeh, a little north of Jaffa; and the Rubîn, a little south of this last town; and the Mukutta or Kishon (Kutta = Kishon), which is sometimes, however, low enough, so low that when it reaches the sea it is lost in the sands. None of these are navigable, but they are rivers all the year round, and wide enough to allow boats to ply on them for some little distance. Horned cattle find plenty of pasture in the Plain of Esdraelon,

and on that of Sharon, about the Ras-el-Ain, or source of the Aujeh, and along the banks of all the above rivers, and near the springs upon the plains. Passing travellers are apt to overlook these things, and to bring home a worse report of the land than it deserves for barrenness and want of water. With one thing certainly they are struck, the innumerable water-courses in every part of the land, which would make its irrigation so minute and complete were the rain sufficient to fill these, or rather sufficiently regulated and distributed over the year to keep these always filled; and were this land thoroughly clothed, and its soil protected by wood, as to moderate the heat and prevent the excessive evaporation. The words of Moses were true words when he called it 'a good land, a land of brooks of water, of fountains and depths that spring out of valleys and hills.' The whole land bears marks of being better watered than at present, and contains everywhere the remains of those artificial appliances, such as terraces, cisterns, and wells, by which the rain was regulated and distributed. In this respect it resembled Egypt somewhat, in so far as in that land there is such ample provision, by wells and canals, for retaining the waters of the Nile when their annual overflow has subsided; but there is this great difference—Egypt required but little skill, and cost, and labour in its storage of Nile-water; Palestine needed all these in a great degree, taxing the hands and heads of its inhabitants, and evoking thereby an amount of steady, patient industry which produced a hardy, busy, and indomitable population such as Egypt could never boast of.

Lakes.—The lakes of Palestine are more remarkable than its rivers. They are three in number; all considerably below sea-level, yet visible from far distances. For quiet beauty the Huleh, or 'Waters of Merom,' with the adjoining vale, are remarkable, and for subdued attractiveness the Sea of Tiberias; but for brilliance there is nothing to be compared to the Dead Sea. Whatever of tameness there may be about the former two, about this last all is grandeur; and the silvery sparkle of its waters (arising from their saline and bituminous composition) gives a brightness to the scene which is enhanced, not neutralized, by the dark shadows of the Mountains of Moab. These lakes form three singular depressions or troughs in the great natural groove or gorge extending from the Bekâ to the Arabah, about 200 miles. This extraordinary hollow, so far below sea-level, is kept in its present state mainly by its own heat. Were the climate to become a Scottish one, the Sea of Tiberias would rise greatly, and transform the Jordan into a Rhine, in parts of the Ghor into a lake; the Dead Sea would swell up and overflow into the Arabah, producing changes in the whole of the southern region which it is impossible to calculate upon. The length of the Dead Sea is 45 miles; its greatest breadth 12. The density of its waters varies between 1160 and 1230 (pure water being 1000). Professor Hull has recently (1884) discovered that the Dead Sea formerly stood 1400 feet above its present level, or 150 feet above the Mediterranean.

Wells and Springs.—With us wells or springs, unless they are very fine or medicinal, are not objects of mark. In Palestine they are all counted worthy of note; sacred too, in a measure, so that it is as much sacrilege to destroy a well as to defile a mosque or injure a tomb. The places named from the En or the Beer are very numerous. Among these we have 'the Fountain of Two Calves,' En-Eglaim, near the Dead Sea; the 'Fountain of Gardens,' En-gannim, of which name there were two cities, one in Judah and another in Issachar; the 'Fountain of the Goat,' Engedi, now Ain Jiddi, on the shore of the Dead Sea, one of Judah's rocky springs; the 'Fountain of Sharpness,' or Swiftness, En-Haddah, one of the springs of Issachar's plains; En-Rimmon, in the southern extremity of the land; the 'Fountain of the Fuller,' En-Rogel, the spring of Jerusalem, known in early ages; &c. Besides these there were many other fountains all over the land. There was Hagar's 'Fountain' or 'Well,' Beer-la-hai-roi, in the southern desert, hard by Beersheba; the 'Fountain in Jezreel,' by which Israel pitched in the battle between them and the Philistines; and others. There are the 'wells' of the patriarchs in different places—the Well of Abraham at Beersheba, now represented by two, still well filled and surrounded by large stone troughs; the wells of Isaac, south of Gerar, Sitnah, Esek, and Rehoboth, of which only the last can be said to have a representative, at Ruhaibeh on the great Roman road, as noted in the Peutinger Tables, where remarkable ruins are to this day visible; the Well of Jacob, dug out of a spur of Gerizim, and close by Joseph's tomb; the Well of Bethlehem, which David knew so well, as no doubt the well of his shepherd-boyhood; the Well of Sirah near Hebron (2 miles according to Josephus), where Abner was overtaken by Joab's messengers; besides other nameless wells all over the land, more precious than gold. There are a good many modern wells in use, which, though probably the remains of ancient ones, are unmentioned in Scripture.

Few of these wells are properly kept up, though none are gratuitously destroyed. Some have become quite unserviceable; and even Jacob's Well is in such a state of disrepair (the masonry in the upper part having fallen in) as to require almost a redigging before it can be of use. Elisha's Fountain still pours out its clear current, though little care is apparently bestowed on it.

Geology.—From the southern border of Palestine, where the hill-country of Judah begins, to the extreme north, there is almost unvarying limestone. Passing from Switzerland to Syria the traveller marks a striking dissimilarity between the Alps and Lebanon; but in passing from Sardinia, or Italy, or Greece, or Asia Minor, he finds an interesting resemblance, in colour and feature and composition, between the rocks of these regions and those of Syria. Syria is, as a whole, a rugged, hilly region composed of limestone of the secondary period; a country seamed and torn by volcanic action from one end to another; long stripes of depression and ridges of upheaval running parallel; the latter broken across and across into wide districts of table-land interspersed with hollows and valleys, with solitary hills or little groups of clustering peaks. 'The great masses of rock (says Robinson) which constitute the mountains of Palestine and Lebanon are Jura limestone; compact, hard, not rich in fossils, and full of caverns and grottoes. This rock is everywhere the basis on which have been deposited in some parts extensive tracts of volcanic products; as also chalk and chalky limestone, magnesian limestone (dolomite), sandstone, conglomerate, marl, &c. On the west of the Jordan and Arabah the chalk formation which prevails through the southern desert terminates with the desert; and the Jura limestone, beginning with the mountains south of Hebron, holds its course northward, forming the mass of the western hill-country of Carmel and of Lebanon. East of the Jordan and Arabah, where, around Petra, large masses of porphyry, sandstone, and limestone lie in close proximity, the same Jura limestone extends northward through the Belkah and the mountains of Ajlûn; and is likewise the basis on which rest the vast volcanic tracts of Haurân, Jaulân, and Lejah.'

Natural History.—The number of mammals inhabit-

ing Palestine is large for the extent of the country, amounting to about eighty in number. Of the wild animals mentioned in the Bible, the lion and the *reém* or unicorn, that is, the aurochs, are no longer found in Palestine. Among carnivorous animals are the wolf, the hyæna, the jackal; the leopard, on the sides of Carmel and Gilead or in the forests of Galilee; and the bear, in Hermon and Lebanon. The wild boar is common, and much dreaded by the husbandmen on account of the ravages it commits. Other Mammalia that may be mentioned are the wild goat, the gazelle, the coney, hare, jerboa, rat, mouse, bat, &c. Of the birds of Palestine the Rev. H. B. Tristram, in his work on the Natural History of the Bible, remarks:—'The number of species collected by myself amounts to 322, and there are at least thirty other species which may be added to the list. Of these the great part are either the same as those of our own country, or very similar in character and appearance. There are, however, many birds of brilliant plumage, which are either extinct in Britain or very rare stragglers to our shores, while there are others which do not extend so far north. The roller, bee-eater, hoopoe, Smyrna kingfisher, belted kingfisher, sun-bird, great shrike, and bulbul may be mentioned among these. But what arrests the attention of the traveller even more than these brightly-clothed birds is the immense number and variety of the larger birds of prey—the vultures, eagles, and falcons—which abound in every part of the Holy Land, and are at first sight its ornithological characteristic. Many of these—eagles, kites, peregrines, buzzards—were once familiar denizens of the wilder parts of England, but have disappeared before the increase of human population. Others, as the griffons and vultures, are the useful scavengers of warm climates, scarcely ever seen in more northern latitudes.' Reptiles are very numerous. They include the land and the water tortoise, the crocodile (leviathan), the chameleon, and a variety of lizards and serpents. Fishes are abundant in the Jordan and its affluents, and in the Sea of Galilee are found in immense shoals. The most numerous species are the barbel and the bream. Descending lower in the scale of animals, we may mention the scorpion, the locust, hornet, bee, and grasshopper. The flora of Palestine is large and varied; about 1000 species have been noticed, and the whole number is probably at least 2000. Among the trees are the cedar, oak, ash, olive, palm, sycamore, oleander, walnut, &c. Wheat, barley, and other grains are cultivated; the vine is almost neglected now, though there is no country better suited to its cultivation than Palestine.

History.—The name Palestine, derived from the Hebrew *Pelescheth*, and meaning the land of the Philistines, occurs in this sense in several passages of the authorized version of the Bible, and in several others in the Hebrew, where it is translated *Philistia*. It is properly applicable only to the south-west part of the country, stretching along the shores of the Mediterranean. It appears to have been first used in its more extended sense by Greek authors, and derived additional currency from its adoption by Josephus and Philo. The ancient name of the country was Canaan, which it evidently owed to the descent of its inhabitants from Canaan, the fourth son of Ham, and a grandson of Noah. When thus named, in the time of the patriarchs, it was parcelled out among a number of independent tribes or nations; the Kenites, Kenizzites, and Kadmonites, on the east of the Jordan; the Hittites, Perizzites, Jebusites, and Amorites, in the hill-country of the south; the Canaanites proper, in the centre, from the Jordan to the coast; the Girgashites, on the east shore of the Lake of Tiberias; the Hivites, in the north, among the ramifications of Lebanon; the Philistines on the south, and the Phœnicians on the north coast. In the time of Moses the country east of the Jordan was conquered and divided among the tribes of Reuben and Gad and the half tribe of Manasseh. Under Joshua the work of conquest was carried on to the west of the Jordan; and the whole territory, though not to the extent originally promised, allotted to the remaining half tribe of Manasseh and the other ten tribes (1445 B.C.); the larger portion of the south falling to the tribes of Judah and Benjamin. Under Solomon the work of conquest appears to have been completed, and all the land which was originally promised was included within the limits of his kingdom. Under his son Rehoboam the kingdom was rent in twain, and subdivided into the separate kingdoms of Judah in the south, and Israel in the north (975 B.C.) The latter kingdom was often designated by the name of Samaria, its capital. The division of the country into tribes was completely broken up by the captivity, which carried away ten of them to Assyria, and supplied their place by a new colony; and by the subsequent transportation of the remaining tribes of Judah and Benjamin to Babylon (584 B.C.) After the destruction of the Babylonian Empire Palestine fell under the dominion first of the Persians and then of the Macedonians. In the time of our Saviour, when the Romans had established their ascendency, it was divided into the four provinces of Galilee in the north, Samaria in the centre, Judea in the south, and Perea, which included all the country east of the Jordan. Under Constantine Palestine, now regarded as the Holy Land, acquired new interest, and recovered in some degree from the calamities by which it had been laid desolate; and in A.D. 396, on the division of the empire by Theodosius, and the formation of two empires, a Western and an Eastern, Palestine became a province of the latter. This was its condition at the time when Islamism began to make its conquests. Palestine, unable to offer any resistance, soon fell a prey; and Omar, in 636, after taking possession of its capital, converted it into one of the provinces of his caliphate. The severities exercised towards the Christians having roused the indignation of Europe, gave rise to the Crusades, and Jerusalem became for a time the capital of a Christian kingdom. Ultimately, however, Mohammedanism prevailed, and Palestine sunk into a degraded state; from which, as yet, it has not shown any symptoms of recovering. The sultans of Egypt ruled it till 1517, when it was taken by the Ottoman prince, Selim I., and incorporated with the Turkish Empire. At present the whole of Palestine west of the Jordan is divided into seven districts; El-Kods, including Jerusalem, Jericho, and about 200 villages; El-Khalil or Hebron, and the south part of Judea; Gaza, on the south coast, with the towns of Gaza and Jaffa; Loudd, or the environs of ancient Lydda; Nablous or ancient Sychar and Samaria; Areta, including Mount Carmel, and a part of the Plain of Esdraelon; and Safed or Saphet, nearly identical with ancient Galilee. See JERUSALEM, JEWS, CRUSADES, &c.

PALESTRINA (ancient *Præneste*), a town, Central Italy, province of Roma, 23 miles E.S.E. of Rome, It is of Greek origin, and had become important long before Rome existed. Under the Roman Empire it attained its greatest magnificence, and was often the residence of the emperors. It has numerous remains, but the only modern buildings of note are the Barberini Palace, now deserted, the church of Santa Rosalia, and numerous tombs of the Colonna and Barberini families. Pop. 6015.

PALESTRINA, GIOVANNI PIERLUIGI (or PIETRO ALOISIO) DA, a great musical composer and reformer

of ecclesiastical music, also styled *Il Prenestino*, was born at Palestrina (Præneste), in the Papal States, in 1524. In 1540 he entered the school of music established in Rome by Claude Goudimel. In 1551 he was appointed by Pope Julius III. master of a choir of boys in the Julian Chapel, and was the first to receive the title of chapel-master. In 1554 he published a first collection of masses written in the style of the period, but containing some admirable passages. Julius, to whom his work was dedicated, admitted him without the customary examination into the college of choristers of the pope's chapel. This unusual favour gave dissatisfaction to the other choristers, who complained of Palestrina's want of voice, and raised a great agitation against him. The pope disregarded their murmurs, but unfortunately he died a few weeks after Palestrina's appointment, and his successor, Marcellus II., also a patron of Palestrina, only lived twenty-three days after his election. Pope Paul IV., who succeeded to the Papal chair 23d May, 1555, was scandalized at finding several of the choristers of his chapel married men. Palestrina was dismissed for this offence. Being poor and burdened with a numerous family he fell ill with this disappointment. His fellow-choristers now forgot their enmity, and zealously expressed their sympathy. A new appointment was soon found for him as chapel-master of St. John's Lateran, which he held for six years, when he exchanged it for the same post in the Santa Maria Maggiore, in which he continued till 1571.

About this time the Council of Trent on re-assembling in 1562 had taken up among other subjects the abuses which had gradually sprung up in the music of the church, and which had grown to an intolerable height. Not only were masses founded on profane airs, often of the most frivolous kind, but the composers of the day, as their manuscripts show, not content with working upon popular airs which suggested the most unbecoming associations, actually imported the words of the profane melodies into their scores, and the singers of the principal part, the tenor, unblushingly gave them utterance while the other parts responded with the words of the sacred service. What, if possible, aggravated this profanation was that, while the mass was in Latin, the Homme Armé, or other preposterous ballad uttered by the tenor, was in a vulgar and understood tongue. The Council of Trent had well-nigh lost its patience over the complications of this aggravated state of disorder, and banished music from the church altogether; but milder councils prevailed, and a thorough reform was determined on. This was intrusted to the pope, who appointed a commission consisting of eight cardinals and eight choristers of the Papal chapel to inquire into and regulate the matter. The commission, as the basis of their reform, agreed upon two resolutions—that no words foreign to the sacred text should be allowed to be sung in the service, and that masses composed on profane airs should be excluded from the ritual. The musicians and choristers, with the customary prejudice of established authorities against theoretical reforms, declared these conditions impracticable. There was no such music in existence as the commission required, and Palestrina, almost the only composer from whose works some illustrative fragments could be drawn, was intrusted with the task of showing that the recommendations of the commission were as consistent with the requirements of art as they were with common sense and religious decency. In fulfilment of this important task he composed three masses for six voices, which by their artistic beauty and profound devotional feeling at once settled the question beyond dispute. One of them in particular, the Missa Papæ Marcelli, so called in gratitude to his patron, at once established for him a position in the highest rank of musical genius, a place to which the subsequent advance of musical science has only confirmed his claim.

In reward for this great achievement Palestrina was appointed in 1571 chapel-master of the Basilica San Pietro at the Vatican, and musical director to the congregation of the Oratory. He also became teacher of the musical school founded by Nanini. He likewise undertook the revision of the chants of the Missal and the Breviary. These, together with numerous musical works, composed the labours of his later years. Unfortunately this man of acknowledged genius, to whom the church was confessedly indebted for a most valuable reform in her service, and upon whose tomb was inscribed as the judgment of his contemporaries the epitaph *musicæ princeps*, was left for a long series of years to struggle with absolute poverty and want. His salary as chapel-master was about £25 a year, and his other appointments were equally insignificant, while, to the disgrace of successive popes, his petitions for pecuniary aid were unavailing. The modesty and piety of Palestrina aggravate this injustice. In dedicating one of his last productions to Pope Sixtus V. he gives a touching account of his sufferings. Palestrina died on 2d February, 1594. His last words were an injunction to his only surviving son to publish his remaining works 'for the glory of the Almighty and his worship in the congregations of the faithful.'

PALETTE, Painter's, an oval tablet of wood, ivory, or other material, very thin and smooth, on which painters lay the various colours they intend to use, so as to have them ready for the pencil. The colours are mixed in the middle and placed round the sides of the palette. It is held by a hole at one end in which the thumb is inserted.

PALEY, William, a celebrated theological and philosophical writer, was born at Peterborough in 1743. His father, who belonged to a Yorkshire family, was soon after appointed head-master of King Edward's School at Giggleswick in that county, and here young Paley received his early education. In 1758 he became a sizar of Christ College, Cambridge. During his first two years at college he led an idle and dissipated life, but afterwards applied himself vigorously to study, and in 1763 he graduated B.A. as first wrangler. In 1765 he obtained the first prize for a Latin prose dissertation in which he espoused the cause of Epicureanism as better fitted than Stoicism to exercise a beneficial influence on the manners of a people. In 1766 he took his degree of M.A., and became a fellow and tutor of his college. In 1767 he was ordained a priest. He held the tutorship of his college for about ten years, and his lectures during this period, which were highly successful, contained the elements of his future works. In 1776 he married and gave up his fellowship. His friend Dr. Law, bishop of Carlisle, had already presented him with the living of Musgrave in Westmoreland, to which he retired, and he afterwards received two other small livings. In 1780 he became prebendary of Carlisle, and in 1785 chancellor of the diocese. In 1794 he was made prebendary of St. Paul's and sub-dean of Lincoln, and in 1795 he received the valuable rectory of Bishop-Wearmouth, upon which he resigned his appointments in the diocese of Carlisle, but retained his sub-deanery. He also received in this year the degree of D.D. from the University of Cambridge. About 1800 he became subject to a painful disease of the kidneys. He died at Bishop-Wearmouth, 25th May, 1805. Paley was liberal and philanthropic in his views, and was a strenuous supporter of Wilberforce and Clarkson in their efforts to abolish the slave-trade.

The principal works of Paley are, The Principles of Moral and Political Philosophy (1785); Horæ Paulinæ (1790); a View of the Evidences of Christianity, in three parts (1794); Natural Theology, or Evidences of the Existence and Attributes of the Deity collected from the Appearances of Nature (1802). All these works have taken a high position in literature, and of all of them there have been numerous editions, abridgments, and annotations. It will be sufficient to notice the celebrated edition of the Natural Theology, illustrated by Lord Brougham and Sir Charles Bell, published in 1835–39, and the collected edition of his works, including sermons and a biography, edited by his son (seven vols. 8vo, 1825). As a writer Paley was distinguished by clearness and cogency of reasoning, force of illustration, and lucidity of arrangement. The comparison of his writings with various sources has shown that he had little claim to originality, and he himself has acknowledged in a general way his indebtedness to others; but what he borrowed he generally set in a clearer light, and by his handling the ideas of other thinkers were divested of the extraneous encumbrances with which the idiosyncracy of an original writer often surrounds his conceptions, and developed with the practical sagacity and strong common-sense which characterize the best English writers.

In his Moral and Political Philosophy he follows the principles of Locke. He rejected the theory of a moral sense invented by Hutcheson to save the morality of the school of Locke, and founded his system purely on utilitarianism. Private advantage is the fundamental principle of his moral system, and the will of God becomes a moral law to his creatures because of his power to reward and punish them. In politics his moral theory led him to reject the doctrine of the divine right of kings, which he compared to the divine right of constables. His theory of honour has been specially censured by Sir James MacIntosh. The idea of the Horæ Paulinæ, long considered Paley's most original work, is said to have been suggested by Dr. Doddridge. Its object is to show, by means of undesigned coincidences between the Acts of the Apostles and the Epistles of St. Paul, the genuineness of both the history and the Epistles. The Evidences of Christianity is mainly founded on Lardner's Credibility of the Gospel History, while Butler and others contributed to its completeness. Many able writers have borne very strong testimony to the cogency of this work. John Foster regards it as 'the close of the great argument,' and would feel no despondency if assured that no such efficient reasoner should again appear. Against the Natural Theology a graver charge than that of borrowing from known writers has been brought, and in great measure substantiated. The plan and a great portion of the details of this work have been shown to be taken, without direct acknowledgment, from a work of Bernard Nieuwentyt, a Dutch philosopher of the previous century (1654–1718), on the Right Use of Contemplating the Works of the Creator, an English translation of which by Chamberlayne, under the title of the Religious Philosopher, appeared in 1718–19. The celebrated illustration of the watch is taken almost literally from Nieuwentyt. Paley mentions Nieuwentyt in his preface, and elsewhere incidentally refers a particular observation in his work to him, but he by no means acknowledges the extent of his obligations to his work. The defence offered in his behalf is that his notes being collected at the time of his lectures (more than twenty years previously), he had forgotten, if not the extent of his obligation, at least the authority to whom they were due, and that his general acknowledgments, which are at least sufficiently apologetical for faults of memory, cover the appropriation. But where extensive and explicit copying in a particular work from a single writer are concerned, this defence will not commend itself to many minds as a satisfactory one. For the details of this controversy see the Athenæum, August 12, September 9, 16 (pages 803, 907, 933), 1848.

PALGRAVE, Sir Francis, Knight, was born in London in 1788. He was a Jew, and his original name was Cohen. He assumed the name of Palgrave in 1823, in consequence of his having renounced the Jewish religion. At this time he married the daughter of Dawson Turner, F.R.S. In 1827 he was called to the bar as a member of the Inner Temple. He devoted himself especially to historical antiquities, which he investigated with great zeal. He early made himself known by his contributions in this department to periodical literature, and he edited under the commissioners of public records the parliamentary writs from 1273 to 1327, which appeared in four folio volumes, 1827–34. In 1831 he was elected F.R.S. and F.S.A. In 1832 he was knighted. In 1833 he was a member of a commission under the Great Seal appointed to inquire into the condition of the municipal corporations of England and Wales. The commission consisted of twenty members, and a minority of four, including Sir Francis Palgrave, dissented from the report, which formed the basis of the Municipal Reform Act. In 1838 he was appointed deputy-keeper of the public records, and in this capacity he for many years presented an annual report to Parliament. He died at Hampstead 6th July, 1861. Sir Francis Palgrave's researches into mediæval and especially early British history are highly esteemed for their scholarship, and he possessed the power of making his works on these subjects popular and interesting by the attractions of style. The following are among his principal works:—The Rise and Progress of the Commonwealth—Anglo-Saxon Period (two vols. 4to, London, 1832); Conciliatory Reform, a Letter to T. S. Rice (London, 1831); an Essay upon the Original Authority of the King's Council (not printed for sale; London, 1834); Documents and Records illustrative of the History of Scotland (London, 1837); Truths and Fictions of the Middle Ages (London, 1844); Reports of the Deputy-keeper of the Public Records (1840–61); the History of Normandy and England (vol. i. 1851; ii. 1857; iii. and iv. 1864)—the work to which he devoted the last years of his life. It is a work of singular interest and of great historical value.

PÂLI, a language formerly spoken in India, being one of the most ancient of the Prâkrit dialects. It was formerly generally supposed to be derived from the Prâkrit dialect called Mâgadhî, spoken in Magadha, a district of Bengal; but Lassen traces it to Western Hindustan, between the Jamna and the Vindhya Mountains, and supposes it to be related to the Śauraseni and Mâhârâshtrî. It was the sacred language of the Buddhists, and was driven out of India along with them; but they carried it to other countries, particularly Ceylon, Indo-China, and Birmah, where it was superseded as a spoken language by the vulgar tongues. From an examination of the Pâli grammar the language appears to have been derived immediately from the Sanskrit, which it closely resembles. The date of its formation would appear to be fixed by the fact that it was spoken by the Buddhists of Ceylon, and not of Thibet, from which it has been concluded that at the time of the earlier migration of the Buddhists to Thibet Sanskrit was the language spoken by them in India, while by the time of the migration to Ceylon they spoke Pâli. It has also

been decided by Burnouf and Lassen, from a comparison of the two languages, that the Prâkrit of the Jainas has been derived from the Pâli. The Pâli literature embraces all branches of Indian learning, but more particularly works relating to the religion and philosophy of Buddhism, and lives of the Buddhist saints. The very voluminous canon of the Buddhist scriptures falls into three divisions, the first, comprising works on liturgy and religious observances; the second, works on morals, dogmatics, law, &c.; the third, miscellaneous treatises on metaphysics, sacred legends, &c. Little of this literature has as yet been printed: we may mention Kammavâkya, liber de officiis Sacerdotum Buddhicorum, by Spiegel (Bonn, 1841); and Rasavâhini, a collection of legends in Spiegel's Anecdota Palica. The Mahâvansa, a history of Ceylon in ancient Pâli, compiled by Mahanâma, was published in Ceylon in 1837. It contains the history of the island from the year 587 B.C., with an outline of the Buddhist history of India. It is printed in Roman characters, with an English translation by the Honourable George Turnour, and an introductory essay on Pâli Buddhistical literature. See Essai sur le Pâli par Eugène Bournouf et Chr. Lassen (8vo, Paris, 1826), and Observations grammaticales sur quelques passages de l'Essai sur le Pâli (Paris, 1827); a Pâli Grammar and Vocabulary, by B. Clough (8vo, Colombo, 1824); and Childers's Pâli Dictionary.

PALIMPSEST (from Greek *palin*, again, *psēstos*, rubbed), a manuscript prepared by erasure for being written on again. Both the Greeks and Romans followed the practice of erasing manuscripts for the purpose of again using the parchments on which they were written. They called these manuscripts palimpsests. Plutarch compares Dionysius of Syracuse to a book written on a manuscript repeatedly erased and in which the old writings appeared through the new. Cicero banters his friend the lawyer Trebatius upon his economy in using palimpsests in his correspondence, and expresses the hope that it is his own consultations and not Cicero's letters that he erases for the purpose. No ancient palimpsests have come down to us, and it does not seem probable that the use of them by the Greeks and Romans can have been attended with any disadvantage to literature. The manuscripts reused by them were probably in their own language, and they would select for the purpose either imperfect copies or works of no value. Even on the extreme supposition of any valuable manuscript being destroyed in this way it would only reduce the number of copies of an extant work, and in no way endanger its existence. While the Greek and Roman were living languages, and the people who spoke them were the custodiers of their own literature, the danger to the works of a good writer from the value of the material on which they were written would scarcely be greater than that to which the printed works of a reputable author are now exposed from the butterman. In both cases the only danger would arise from over-multiplication of copies, and scarcity itself would enhance security. It was different, however, when the Greek and Roman commonwealths had been overthrown, and the few remaining copies of the works of their great authors were in the hands of strangers. It was in these circumstances, and when almost all the ancient manuscripts preserved in Europe were accumulated in the monasteries, the last resorts of such learning as remained, that the use of palimpsests began to prevail in the middle ages. It is still a matter of controversy whether literature has gained or suffered by the practice. On the one hand, it is held that but for the value attached to their material for the purpose of rewriting the scraps of ancient manuscripts which have come down to us in the form of palimpsests would have been wholly lost. On the other, it is believed that numerous valuable manuscripts have in this way been ruthlessly destroyed which otherwise might have been wholly preserved. We shall content ourselves with stating some of the leading circumstances regarding the use of palimpsests in the middle ages, and the modern search for manuscripts concealed in them, and will leave the reader to choose which of these views he prefers.

It was in the seventh century, when the conquests of the Caliph Omar had cut off from Europe the supply of papyrus furnished by Egypt, that a great deficiency in the supply of parchment began to be felt. The scarcity continued until the general use of parchment had been superseded by paper. The use of palimpsests appears to have gradually increased until the eleventh century, when it reached its height. Great differences of opinion however exist both as to the actual and relative extent of the destruction of manuscripts, some attributing the loss of nearly the whole of ancient literature to the eighth century. From the time of the Renaissance the objectionable nature of the practice was discovered, and edicts forbidding it began to appear, but it had not entirely ceased on the introduction of printing. In the East the use of palimpsests began much later, and never became so general as in the West. The scarcity of parchment for literary purposes was increased by the demand for legal documents, for the more important of which fresh parchments would have to be procured at any cost. There appears little doubt that the ravages must have been both long continued and extensive. The monasteries of Bobbio, Fulda, St. Gall, and Mainz were rich in manuscripts, and seem, especially the first, to have been among the most extensive manufacturers of palimpsests. That which replaced the ancient manuscripts was almost always some writing of an ecclesiastical character, lives of the saints, and copies of the church services, for which there was of course a constant demand, but the multiplication of copies of which added nothing to literature. It would also appear certain that the monks were very often not only indifferent from ignorance to classical literature but hostile on religious grounds to its preservation, and that they esteemed it meritorious to turn the manuscripts in their possession from a profane to a sacred use. In the proceedings of the councils frequent instances are to be found of the hostility of the church to Pagan literature, although some enlightened churchmen are known not to have shared it.

In the reused manuscripts the pages are frequently cut or differently folded, sometimes the new writing follows the order of the old, sometimes it runs transversely to it, sometimes the latter is turned upside down. The success of the eraser in obliterating the ancient writing also varied greatly, and those who consider the use of ancient manuscripts in this way to have been most extensive believe that in the great majority of cases it was complete.

At the Renaissance attempts were made to decipher the ancient and underlying writing on these manuscripts, but from the want of chemical appliances they were generally unsuccessful. It was not till the eighteenth century that any decided progress was made. Knittel (1761) deciphered fragments of a Bible of Ulphilas, and Bruno some years later discovered some entirely new fragments of Livy and Cicero. Niebuhr and others made subsequent discoveries, and the subject was taken up systematically and pursued with great success by Angelo Mai, librarian successively of the Ambrosian and Vatican libraries. See his biography.

The processes employed in deciphering palimpsests

vary according to the nature of the manuscripts. Those which have been scraped and rubbed with pumice-stone and afterwards bleached are nearly indecipherable. Those which have been merely washed with lime-water and dried are revived by chemical processes, which vary with the composition of the ink. Various recipes which have been found successful are used successively till the right one is found. The result of the researches made is on the whole disappointing, according to some because the monks only made use of imperfect copies and fragments of ancient writings for their palimpsests, according to others because they carried on the remanufacture of clean parchments wholesale, mixing up in the process various manuscripts, cutting them into fresh shapes, and thus obliterating for ever the connection of the original works. It is certain that the discoveries made are all or nearly all fragmentary, nevertheless many of the fragments are of great value. A considerable number of fragments of the Bible of various manuscripts, considerable sections of the Iliad and numerous fragments of Greek historians, and portions of Plautus, Cicero, Sallust, Tacitus, and other Roman writers have been recovered.

PALINDROMON, a verse or line which reads the same either forwards or backwards; for example, that which is put in the mouth of Satan—*Signa te, signa, temere me tangis et angis* (cross thyself, cross thyself, you touch and torment me in vain), or of which each word can be reversed, as *Anna tenet mappam madidam, mulum tenet Odo.*

PALINURUS. See Lobster.

PALISADES, stakes 8 or 9 feet long and 6 or 7 inches square, and sharpened at the end, which are set in the ground either perpendicularly or obliquely for the greater security of a fortification, particularly for the closing up of an open passage to the works or the protection of any exposed point previous to an attack.

PALISSOT DE MONTENOY, Charles, a French writer and poet, born at Nancy in 1730. After completing his studies and obtaining an academical degree in the theological faculty as early as his sixteenth year, entered the congregation of the Fathers of the Oratory, but quitted it before he had been ordained, and resolved to devote himself to literary pursuits. He wrote two tragedies, one of which, called Ninus, was performed with some applause. He next attempted comedy, and produced two pieces, Les Tuteurs and Le Barbier de Bagdad, which were favourably received. His name became more generally known in 1755, when King Stanislas at Nancy commissioned him to produce a theatrical piece for the inauguration of the statue of Louis XV. On this occasion he wrote, besides an allegorical prelude, a satirical cabinet piece (*pièce à tiroir*) entitled Le Cercle, in which he gave a most amusing description of the interior of literary coteries and the foibles of overrated poets, arrogant patrons, learned ladies, &c. The whole was a caricature, and must have appeared very severe, as he brought forward the irritable J. J. Rousseau into the piece, and made him truly ridiculous. The consequences to Palissot were very unpleasant, as he brought the whole body of encyclopædists upon him, and lost the favour of King Stanislas. Among the mass of those who attacked him with lampoons Morellet was most conspicuous. Palissot, on his part, was not idle. He first wrote his Petites Lettres contre de Grands Philosophes, and then produced his comedy Les Philosophes. The wrath of the philosophers, who in this comedy were roughly handled, and, according to Voltaire's expression, were exhibited as folks who, while they give you lessons, have their hands in your pockets, knew no bounds, though it is somewhat remarkable that Voltaire, in his letters to the daring satirist, exhibited unwonted moderation. A third attack on the false taste of the time, from which Palissot himself was by no means free, was made in his satirical epic called La Dunciade (two vols. Paris, 1764), which, while not deficient in either wit or biting satire, fails in want of durable interest. His only work which now possesses some value is his Mémoires pour servir à l'Histoire de la Littérature Française. He published one of the best editions of the works of Voltaire (1789). The revolution deprived him of most of his property. After attaining a very great age, in the full possession of all his faculties, he died in 1814.

PALISSY, Bernard, a French artist and philosopher, was born according to D'Aubigné in 1499, according to other biographers about 1510, at La Capelle-Biron, a town of the Agenais (Lot-et-Garonne). He was apprenticed to a glass-work at Agen, where he learned the art of painting on glass and that of joining the painted panels. He thus acquired the arts of figurative and mechanical design. When he had completed his apprenticeship he set out on a tour of France and Germany (1528). He travelled through all the provinces of France, Lower Germany, the Ardennes, Luxemburg, the Duchy of Clèves, and Breisgau, maintaining himself by practising from town to town the two arts of painting on glass and land-surveying. During his travels he studied attentively all that came before him, especially in what related to natural history and the antiquities of the globe. He returned to France, married, and settled himself at Saintes in 1535. He would appear on his travels to have adopted the Reformed religion, which he established at Saintes some time after his return. Having been selected in 1543 to draw up the plan of a government survey in his neighbourhood the remuneration he received enabled him to carry on experiments in enamels, to which his attention had been accidentally turned, and on which he had for some time been engaged. Being ignorant of the art of the potter he had to grope his way, and made experiments with all kinds of materials, which for a long time were unsuccessful. At last he obtained a white enamel, but his subsequent experiments proved most laborious, and his wife and friends looked upon him as mad. He was compelled at last, by his own account, to burn his furniture in order to keep in his oven. The fatigue he endured in conducting himself all the operations necessary to the completion of his discovery was excessive. At length, after sixteen years of unremunerated labour (1538–54), he succeeded in producing a pure white enamel, affording a perfect ground for the application of decorative art. He was now able to produce works in which he represented natural objects grouped and portrayed with consummate skill. His reputation rapidly spread, and he acquired a patron in the Duke de Montmorency. His sculptures in clay and his enamelled pottery once known became recognized as genuine works of art, and came into demand for the decoration of the houses of the great. Religious persecution, however, which had spared him in obscurity, fastened on him as soon as he had begun to attain to wealth and distinction. He was first imprisoned at Bordeaux on the charge of being a Calvinistic preacher (1562), and was threatened with death, when he was rescued by the Duke de Montmorency, who, to save him from the provincial authorities, procured him the title of *inventeur des rustiques figulines du roi*, with which he went to establish himself at Paris. Here he was patronized by Catharine de' Medici, who gave him a site for his furnaces on the present situation of the palace of the Tuileries, where the remains of them were discovered in 1865. Here he continued to work for some years

without interruption, assisted by his sons, and besides numerous works of art produced during this period he devoted himself assiduously to the study of chemistry, geology, and natural history. He had from his own observations made during his travels conceived the idea of a unity in nature; he collected a cabinet of natural history, and extended his observations in every direction as far as his opportunities permitted. But he was deficient in scholarship, and he was anxious to know if others, especially the great philosophers of antiquity, had interpreted nature otherwise than he did himself. On this account he determined to open conferences, to which he proposed to invite the most learned men of his day in order to communicate his views to them, that they might instruct him if he was mistaken. During Lent, 1575, accordingly, he placarded Paris with an invitation to all the doctors and learned men to attend three lectures, in which he should explain his views on fountains, stones, metals, and other objects, and for entrance to which he proposed to charge a crown, in order, as he explains, that he, having taken their money, they might contradict him if he lied, and he put in his bills that if what he said was false he should restore them fourfold. The lectures were actually delivered on these singular terms without provoking a single challenge. These lectures were afterwards continued for about ten years, and were attended by the most distinguished men in Paris. The substance of them is probably contained in his Discours Admirables, published in 1580. He was the first in France to substitute facts and demonstrations in the teaching of science for mere hypothesis. He established a rational theory of crystallization, and his classification of salts was nearly perfect. His teaching again excited the jealousy of his theological opponents. He was arrested in 1588 and thrown into the Bastille, where he died in 1590, at the age of ninety, according to D'Aubigné, who knew him personally; or of eighty, according to his other biographers. He left two works, of each of which the title is an essay, but which show that he was not only a profound thinker, speculating on almost every subject of human interest, and a geologist in advance of his time, but the master of a style, which, without special education, enabled him to communicate his ideas with a force equal to that of the best writers. Attention was first called to these works in 1777 by Faujas de St. Fond. P. A. Cap published a new and superior edition of them in 1844. A monograph on the artistic work of Bernard de Palissy by C. De Lange and C. Borneman, folio, 100 plates, has been published in Paris, 1863–65. They are among the finest products of the Renaissance. A biography of Palissy has been written by Professor Henry Morley (London, 1852, two vols.)

PALL (1), a covering of black velvet thrown over a coffin while being borne to burial, the ends of which in a walking procession are held by the friends of the deceased. (2) In the Romish liturgy the covering of the altar, or of the sacred chalice during the celebration of mass.

PALLADIO, Andrea, one of the greatest classical architects of modern Italy, whose works of art and writings alike contributed to improve the taste of the age in which he lived, and direct the genius of posterity. He was born at Vicenza, in the Venetian territory, in 1518, and after having studied under Trissino he went to Rome, where he acquired a maturity of skill and science from an examination of the productions of ancient and modern art which that capital afforded. Returning to his native country he established his fame by his designs for many noble edifices both there and in other parts of Italy, which have afforded models for some beautiful structures in England, as well as other parts of Europe. Palladio belongs to the masters who, in the sixteenth century, by the study of the works of Roman architecture created a new era in architecture. Among many splendid works executed from his designs and under his direction, the theatre degli Olimpici, in his native place, is the most brilliant proof of his talents. Venice also owes to him many of her finest buildings. The villa built by Lord Burlington at Chiswick (but since enlarged by James Wyatt) was from a design of Palladio, as was also a bridge at Wilton, the seat of the Earl of Pembroke, in Wiltshire. The majestic simplicity of antiquity was always present to his mind, and Algarotti called him the Raphael of architects. But this great architect is best known in the present age on account of his published works, especially his Treatise on Architecture, in four books, which first appeared in a folio volume at Venice, in 1570, and has been many times reprinted. The best edition is that of Vicenza, 1776–83, four vols. It has also been translated into French and English. James Leoni, an Italian architect, published Palladio's Architecture in English, with the notes and remarks of Inigo Jones, and engravings by Picart (London, 1742, two vols. folio); and some of the designs of this architect were published by Lord Burlington in 1730. Palladio was likewise the author of an Italian work on the Antiquities of Rome (Venice, 1594, and Rome, 1599, 8vo), and of Illustrations of the Commentaries of Cæsar. He died at Vicenza in 1580. Chapuy and Amed. Beugnot published Palladio's Œuvres Complètes, with plates and notes, at Paris, 1827 seq., in twenty numbers folio.

PALLADIUM, a wooden image of Minerva (Pallas), which is said to have fallen from heaven, and to have been found by Ilus, who placed it in a temple in his new city (Ilium). It was believed by the Trojans that their city would be invincible so long as it contained the Palladium. Ulysses and Diomedes, to remove this impediment to the capture of the city, are said to have carried it off. The Romans, however, pretended that it was brought to Italy by Æneas, and preserved in the temple of Vesta at Rome. It was considered so holy that even the *pontifex maximus* did not dare to look upon it. Other cities, however, claimed to have possession of it. The term palladium has figuratively acquired the sense of bulwark, protection, sanctuary.

PALLADIUM, the name of a metal discovered by Wollaston in 1803, associated with platinum ore, among the grains of which it exists alloyed with iridium and osmium. The process of separating it from the substances with which it occurs is too long to be detailed here. When pure it is of a grayish white colour, and is scarcely distinguishable from platinum. Finely-divided palladium, floating in water, appears blood-red by transmitted light. It is ductile and very malleable; in hardness superior to wrought-iron, and possessed of a specific gravity of 11·8. It is a less perfect conductor of heat than most metals, and less expansible, though in this it exceeds platinum. On exposure to a strong heat its surface undergoes a tarnish, and becomes blue; at the temperature of the oxyhydrogen flame it melts completely. If touched, while hot, with a small piece of sulphur, it runs like zinc. The sulphide thus formed is whiter than the metal itself, and extremely brittle. Nitric acid acts upon palladium slowly, with the production of nitrous acid, which imparts a fine red colour to the liquid. Sulphuric and hydrochloric acids exert little action on palladium. Nitromuriatic acid, however, dissolves it rapidly, and assumes a deep red colour. Alkalies and earths throw down a precipitate from its solutions, generally of a fine orange colour. Alkalies act on palladium even in the metallic state; the contact of air,

however, promotes their action. A neutralized solution of palladium is precipitated of a dark orange or brown by a solution of stannous chloride; this precipitate dissolves in hydrochloric acid, forming a deep green-coloured liquid. All the metals, except gold, silver, and platinum, precipitate it in the metallic state. Palladium has the atomic weight 106·6; it forms two series of compounds—the *proto-* or *palladous salts*, and the *per-* or *palladic salts*. Thus we know of the two oxides having the formulæ PdO and PdO_2, and of two chlorides, $PdCl_2$ and $PdCl_4$ respectively, &c.

PALLAS, of the minor planets revolving round the sun between Mars and Jupiter, that whose orbit is most inclined to the ecliptic. It was discovered in 1802 by Olbers at Bremen. It revolves round the sun in 4·61 years. The eccentricity of its orbit is 0·23969, and its semi-axis major is 2·77 times that of the earth's orbit. Its diameter is 172 miles. When nearest the earth in opposition Pallas shines as a full seventh-magnitude star, with a decided yellowish light. Traces of an atmosphere have been observed.

PALLAS, Peter Simon, imperial Russian counsellor, celebrated for his travels, particularly in that empire, and for his numerous observations and discoveries made there, born at Berlin, 1741, was the son of a physician, and chose the study of medicine, with the purpose of devoting himself only to the natural sciences, particularly to natural history. For this object Holland then offered the largest collections and the best instructors. He therefore went to Leyden, and published there in 1760 his dissertations on the Entozoa. He afforded important aid to Volkmann, who was arranging the splendid collection of natural curiosities in the Hague, belonging to the Stadtholder, and became so skilful in the art of arranging and describing collections of natural history, that, after he had visited Britain, he was employed in superintending the arrangement of cabinets in this department, and was thus enabled to publish his Elenchus Zoophytorum (1766, still a classical work on zoophytes). He then returned to Berlin, and began to publish his Spicilegia Zoologica, which reached its fourteenth number. The Empress Catharine was at that time seeking for a naturalist to explore her immense empire. In 1768 Pallas was invited to St. Petersburg as academician, and performed his first journey through several provinces of Russia, the Journal of which was published at the expense of the empress (St. Petersburg, 1771–76, 4to). In 1777 he became a member of the committee for the measurement and topography of the Russian Empire. In the meantime botany had become his favourite study, and he made several excursions into various provinces of the empire to examine their plants. The magnificent *Flora Rossica*, begun at St. Petersburg in the early part of 1785, but afterwards dropped, was the first fruit of these botanical tours. No part indeed of the history of nature or man was untouched by him, as is manifest from his Historical Collections, his New Essays on the North, his excellent Icones Insectorum, and his Contributions to the Glossary of all the Languages and Dialects of the Russian Empire. In 1785 he was made a member of the Imperial Academy of Sciences at St. Petersburg, and knight of the order of Vladimir, and in 1787 historiographer to the Admiralty College. As it was his desire to reside in Taurida, the empress gave him several estates in the most fertile portion of the south of the peninsula, and after 1796 Pallas lived at Simferopol with a large income. One of the fruits of his last journey, which he undertook with Geisler of Leipzig, at his own expense, was the work entitled Remarks on a Journey through the Southern Governments of Russia (Leipzig, 1799 and 1801, two vols. 4to). The second part of this book is devoted exclusively to the Crimea, which was thus first completely laid open to us. Besides fourteen numbers of the Species Astragalorum, which may be regarded as a monument of that journey, we may mention his Observations sur la Formation des Montagnes et les Changemens arrivés au Globe, particulièrement à l'égard de l'Empire Russe. The residence of Pallas in Taurida was disturbed by the lawlessness of the natives. He died in 1811, on a visit to an elder brother at Berlin, to the university of which city he bequeathed a part of his valuable collections.

PALLAVICINO, the name of two Italian writers of some celebrity.—1. Sforza, son of Marquis Alessandro Pallavicino, of Parma, was born at Rome in 1607, studied in the Roman College, and afterwards joined the Jesuits. His treatises Del Bene and Dello Stito fixed his reputation, and probably led to his selection by the Papal party as the historian of the Council of Trent. On this work his fame chiefly rests. It was intended chiefly as an answer to the work of Paolo Sarpi on the same subject, but partakes much more of the character of a special pleading than of an authentic and impartial history. He stood high in the esteem of Pope Alexander VII., who made him a cardinal. He died in 1667.—2. Ferrante Pallavicino, born at Parma in 1615, early became one of the canons of St. Augustine, but soon found that he had entirely mistaken his vocation. Having obtained permission to travel he repaired to Venice, where he soon made himself notorious, both for the licentiousness of his life and the obscenity of his writings. He is best known as the author of Il Divorzio Celeste, which contains a very cutting satire against the Church of Rome. The Papal court was exasperated beyond measure, and, determined to have its revenge by fair means or foul, inveigled him after he had taken refuge in France into the territory of Avignon, over which its jurisdiction extended, and beheaded him in 1664.

PALLIOBRANCHIATA (Latin, *pallium*, mantle; Greek, *bragchia*, gills), the name formerly applied to the class of Brachiopodous Mollusca (see Mollusca) from the belief that the pallium or mantle lining the shell formed the chief organ by means of which respiration or breathing was carried on. The most recent observations would seem to point to the long cirriferous *arms*, which stretch away from the sides of the mouth, as the true respiratory organs, whilst the mantle either has no share whatever in the breathing process or plays but a very subsidiary part in it. The arms present a vascular structure, this latter fact lending additional countenance to the idea of their being the breathing organs of the Brachiopoda. A peculiar system of branching tubes, ending in cæcal or blind extremities, ramifies within the lobes of the mantle; but the function of this system, so far from being respiratory, has been more correctly assumed to be connected with excretion or with the conveyance from the system of the reproductive elements.

PALLIUM, or Pall, the woollen mantle sent by the Roman emperors, from the fourth century, to the patriarchs and primates of the empire, to be worn as a mark of ecclesiastical dignity. In the fifth century the patriarchs, with the consent of the emperors, began to send the pall to the archbishops on their entrance into their dignity, and they were obliged to wear it while discharging the higher functions of their office. It became customary, however, to regard the giving of the pallium to archbishops as a sign that their election was confirmed by the patriarchs; and the Council of Constantinople in 872 decreed that all archbishops should be confirmed by their

patriarchs, either by the imposition of hands, or by the sending of the pall. The popes possessed themselves of the right of confirmation in the West, and at first required of the archbishop who was invested with the pall only a written promise of canonical obedience to the Papal see; but from the tenth century exacted a considerable tax on investiture. Notwithstanding the great increase of this tax the pallium was, until lately, regarded as an indispensable mark of confirmation by the pope, and was sent to every archbishop, and to some of the principal bishops, when entering upon their office. Since the twelfth century it has consisted of a white woollen band or fillet, three or four fingers broad, which is thrown over the shoulders outside of the sacerdotal vestments; one band hanging over the back, and another somewhat longer over the breast, and both are ornamented with a red chaplet. This ornament, as simple as it is costly (a sum from £3000 to £4000 was sometimes paid for it), is made by the nuns in the convent of St. Agnes in Rome, from the wool of consecrated sheep, and is buried with its wearer.

PALM, an ancient long measure taken from the extent of the hand. The Roman palm was of two kinds. The *great palm*, taken from the length of the hand, answered to our span, and contained 12 digits or fingers' breadths, or 9 Roman inches, equal to about 8½ English inches. The *small palm*, from the breadth of the hand, contained four digits or fingers, equal to about 3 English inches. The Greek *palm* or *doron* was also of two kinds: the *small* contained four fingers, equal to little more than 3 inches; the *great palm* contained 5 fingers. The Greek *double palm*, called *dichas*, was large also in proportion. The modern palm is different in different places where it is used. It contains at Rome 8 inches 3½ lines; at Naples, according to Riccioli, 8 inches, according to others 8 inches 7 lines; at Genoa 9 inches 9 lines; at Morocco and Fez 7 inches 2 lines; in Languedoc and some other parts of France 9 inches 9 lines; the English palm is 3 inches. It is not a standard measure.

PALM, the tree. See PALMS.

PALMA, an episcopal city of Spain, capital of the Island of Majorca, 130 miles south of Barcelona, in the bosom of a bay 12 miles in length, and 16 miles in breadth. It is built in the form of an amphitheatre, with a south-west exposure, and enjoys an extremely mild and salubrious climate. It is a walled town. The streets are straight and narrow, with a few exceptions. There are several squares. The cathedral, which towers majestically over all the other public buildings, was founded by Jaime the Conqueror. The principal façade is very modest and simple, having no other ornament than two beautiful towers at its angles, and the portal on the south side is full of Gothic enrichments. The exchange (1426–48) is one of the finest specimens of German Gothic in Spain. The town-house contains a gallery with portraits of eminent natives. Palma is well provided with educational and charitable institutions. At the centre of the port rises the celebrated mole, which, running out from the bastions facing the south, advances into the sea about 500 yards, and on each side of it is the ship-building yard, where numerous hands are employed in the construction of the swift lateen vessels, so well known and highly prized in the Mediterranean. On the east of the mole is an open dock, which is, however, rapidly being silted up. On the south side of the bay there is a fort on St. Carlos Point, whose guns command a wide range. Two lighthouses stand at the entrance of Porto Pi, a narrow road, where the largest frigates might anchor, in small number, however. About midway between the city and Porto Pi is seen the castle of Bellver, on an eminence, surrounded by pine groves. The Lazaretto, which is spacious and admirably conducted, has the best anchoring ground in front of it. The industry and manufactures comprise linen, woollen, and silk tissues, soap, glass, brandy, thread, besides a number of oil and flour mills. Navigation and mercantile traffic are in a state of considerable activity, and its large importations from the Peninsula and foreign countries constitute Palma the mart of the whole island. Pop. 58,224.

PALMA, LA, the most north-westerly of the Canary Islands; lat. (north point) 28° 51′ 18″ N.; lon. 17° 53′ 30″ W.; 33 miles long from north to south, by about 15 miles broad; area, 224 square miles; capital, Sta Cruz de la Palma, one of the principal ports. The island consists for the most part of elevated mountains, often covered with snow and furrowed by deep ravines, and in the north the coast is high and precipitous. The climate is agreeable and healthy, but the island is subject to the ravages of the locust and to volcanic eruptions, by which a new mountain was formed in 1558. In the north of the island is the largest, though long dormant crater, said to be 18 miles in circumference, and about 2664 feet deep. The highest part of the mountain is the peak called Roque, 8426 feet above sea-level. Besides a small quantity of grain, La Palma produces abundance of wine, fruits, almonds, honey, wax, and some silk, with which are manufactured taffetas, black satins, and plain ribbons. Although more populous than Lanzarote and Fuertaventura, it is equally poor and miserable, so that at least three-fourths of the inhabitants live generally on the root of the fern. Pop. 35,380.

PALMA CHRISTI, a name frequently applied to the castor-oil plant.

PALMA DI MONTE CHIARO, a town, Sicily, in the province and 14 miles E.S.E. Girgenti. It is well built; has several churches; and carries on a brisk trade in almonds and sulphur. To the west of the town, crowning the summit of a hill, stands the castle of Monte Chiara, a large square keep with outworks. Pop. 13,497.

PALMBLAD, VILHELM FREDRIK, a celebrated Swedish author, born in 1788 at Liljested, not far from Söderköping in East Gothland, the son of a revenue officer. He proceeded in 1806 to the University of Upsal, where he soon became an active member of the Society of the Friends of Belles-lettres, out of which the Aurora Association sprang in 1807. His taste for poetry was awakened by reading Schiller. In 1810 he purchased the academical printing-press, and forthwith issued the Phosphorus, which continued till 1813; the Poetic Kalendar, which lasted till 1822; and the Svensk Literaturtidende, which ceased in 1824. These periodicals, in which he was assisted particularly by Hammerskiöld and Atterbom, had a decided influence on the development of Swedish literature, and contributed essentially to the sudden victory of the romantic over the classical school. In 1822 he became docent of national history, in 1827 adjunct of geography and history in the Upsal University, and in 1835 its ordinary professor of Greek language and literature. He died in 1852. He is one of the most prolific writers of Sweden. One of his principal works is the incompleted Handbok i Physiska och politiska Geographien (vols. i.–v. Upsal, 1826–37), which is very carefully and thoroughly executed, and in Sweden remains still unsurpassed. A part of it, consisting of Palestine, has been published separately (Stockholm, third edition, 1842). Among his other geographical and historical writings are Lärobok i Geographien (sixth edition, Orebro, 1847); and Lärobok i Nyare Historien (Up-

sal, fourth edition, 1843), which is highly valued, and in general circulation in his native country. He also published translations of Æschylus and Sophocles, and wrote several novels, one of which, Aurora Königsmark (six vols. Orebro, 1846–51), ranks as one of the best works of the kind in Swedish literature. In 1835 he became editor of the very valuable Biographisk Lexicon öfver Namnkunnige Svenska Män (vols. i.–xx. Stockholm, 1835–52), and as first vice-president, and after Afzelius' death president of the United Literary Association, he took a very active part in the periodicals which it has published. He also contributed to many German works, as Ersch and Gruber's Encyclopædia, Conversations Lexicon, &c.

PALMER, in mediæval times, was the name given properly to a pilgrim who had visited the Holy Land, from the circumstance that those who performed the pilgrimage to the sacred sepulchre generally carried on their return a branch of the palm for a staff as a memorial of their journey. The name palmer was also given distinctively to pilgrims who wandered from shrine to shrine without a fixed home, probably because many of the monkish pilgrims who had made the journey to Jerusalem were in the habit of doing so.

PALMERSTON, Henry John Temple, Viscount, was born in Westminster (not at Broadlands, the family seat), on 20th October, 1784. He was educated at Harrow, Edinburgh University, and St. John's College, Cambridge, where he graduated M.A. in 1806. He succeeded to the title on 17th April, 1802. In 1806 he contested the representation of Cambridge University unsuccessfully, with Lord Henry Petty. In the following year he again contested the university unsuccessfully, but was returned for Newport, Isle of Wight, and became junior lord of the admiralty in the Duke of Portland's administration. In 1808 he made a speech opposing a motion of Mr. Ponsonby's for the production of papers in relation to the Copenhagen expedition, in which were contained the germs of his future policy as a diplomatist. In 1809 he succeeded Lord Castlereagh as secretary at war, and in 1811 he was elected member for Cambridge University. He at once began a vigorous reform of the details of administration in his office. He regulated the finances, paid off arrears, and reduced the previous confusion into which the business of the war office had fallen, into one of order and symmetrical arrangement. He mostly confined himself in his parliamentary speeches to the business of his department, in which he had frequent skirmishes with Joseph Hume. One of the questions on which he spoke was Catholic Emancipation, of which he was always a supporter. He retired from office in the Wellington ministry in 1828, along with Huskisson and others of the Canning party. He had already made a reputation for his command of foreign policy, and in 1830 he received from Earl Grey the post of foreign secretary in the Whig ministry, and from this time he continued to be a member and leader of the Liberal party. In 1831 he lost his seat for Cambridge, and was returned for Bletchingly, and after the Reform Bill (1832) for South Hants. He retired from office with the ministry in December, 1834, when Sir Robert Peel came into power; but in April he resumed his former appointment under Lord Melbourne. At the general election he lost his seat for South Hants, and was returned for Tiverton, which borough he continued to represent till the close of his career. He continued in office as foreign secretary till September, 1841. It was during this period he earned that remarkable reputation for vigilance and energy in the conduct of foreign affairs, and especially for guarding with, as many thought, an extreme punctiliousness the interests of individual Britons abroad, which, while it greatly raised his reputation at home, produced extreme irritation, and caused his name to be execrated, in many quarters abroad. In 1841 Sir Robert Peel came into office again, and Lord Palmerston, during the absence of Lord John Russell, had for a short time the leadership of the opposition devolved upon him. A cession of territory to the United States, which he called the 'Ashburton Capitulation,' provoked his opposition to the foreign ministry of the Earl of Aberdeen. In 1845 he declared his adhesion to the repeal of the corn laws. In 1846 he became foreign secretary again in the ministry of Lord John Russell. During the revolutionary period of 1848–49 he manifested his liberal tendencies without active interference with the affairs of foreign states. In 1850 Lord Palmerston espoused the cause of a Portuguese Jew at Athens, Don Pacifico, a naturalized British subject, and blockaded the ports of Greece, which caused the French ambassador to leave London, and nearly produced a war with France. This was the occasion of a keen discussion of his policy in Parliament, and in February, 1851, he accepted the *coup d'état*, and acknowledged Louis Napoleon, without consulting his colleagues. These, and other causes of dissatisfaction, led to his resignation in December, 1851, when he was replaced by Lord Granville. In February, 1852, he defeated the government of Lord John Russell, who was succeeded by the Earl of Derby. Lord Palmerston declined to take office with his late political opponents, but during their brief tenure of office he earned by his patronage of the ministry, who were in a minority in the House of Commons, the soubriquet of Don Pacifico. In December, 1852, he took office as home secretary in the coalition ministry of the Earl of Aberdeen, and on the resignation of this ministry, in consequence of alleged mismanagement of the Crimean war, he was on the almost universal demand of the country called to the premiership. In 1857 Parliament, on the motion of Richard Cobden, passed a vote of censure on the conduct of the Chinese war. A dissolution of the house gave Palmerston a majority, but in February, 1858, he resigned, after being defeated on the Conspiracy Bill. After a brief interregnum, filled by a second ministry of Lord Derby, he returned to power in June, 1859, and continued to hold the premiership during the remainder of his life. The last years of his ministry were comparatively uneventful. He died 18th October, 1865. He was made D.C.L. by Oxford in 1862, and elected Lord-rector of Glasgow University in 1863.

PALMETTO (*Sabal Palmetto*). In the Southern States of America this species of palm grows along the Atlantic coast from about lat. 35° to the extremity of Florida. It attains the height of 40 or 50 feet. The summit of the stem is crowned with a tuft of large palmated leaves, varying in length and breadth from 1 to 5 feet, and supported on long foot-stalks, which give it a beautiful and majestic appearance. Before these leaves are developed they are folded like a fan; at their base and in the centre of the stem are 3 or 4 oz. of a white, compact, and tender substance, which is eaten with oil and vinegar, and somewhat resembles the cabbage in taste, but is neither highly nutritious nor peculiarly agreeable, and, moreover, is attended with the destruction of a vegetable which has perhaps been a century in growing. The flowers are small, greenish, disposed in long clusters, and are succeeded by a black inesculent fruit, about as large as a pea. The wood, though extremely porous, is preferred in the Southern States to every other for the construction of wharves, on account of its being secure from the attacks of sea-

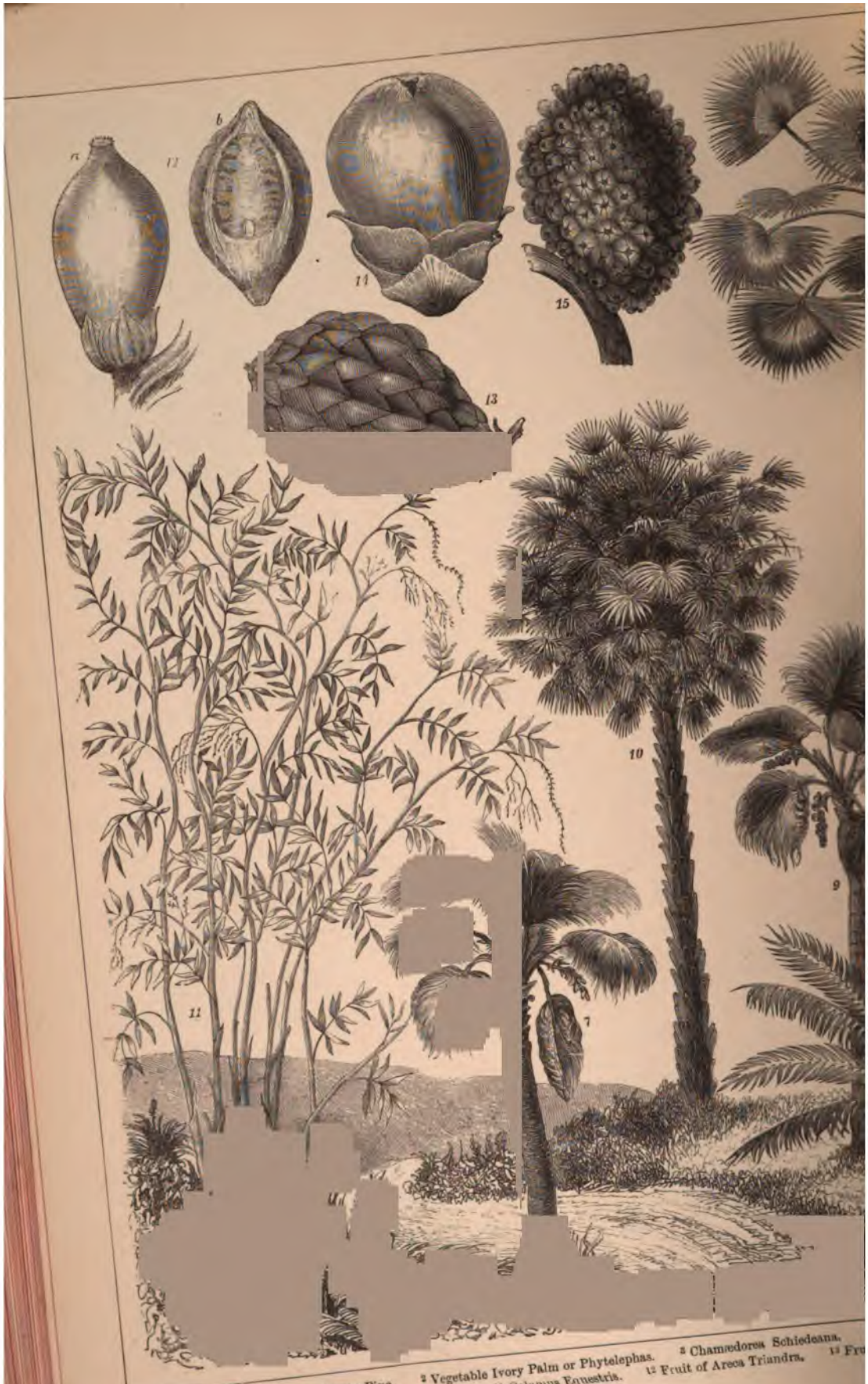
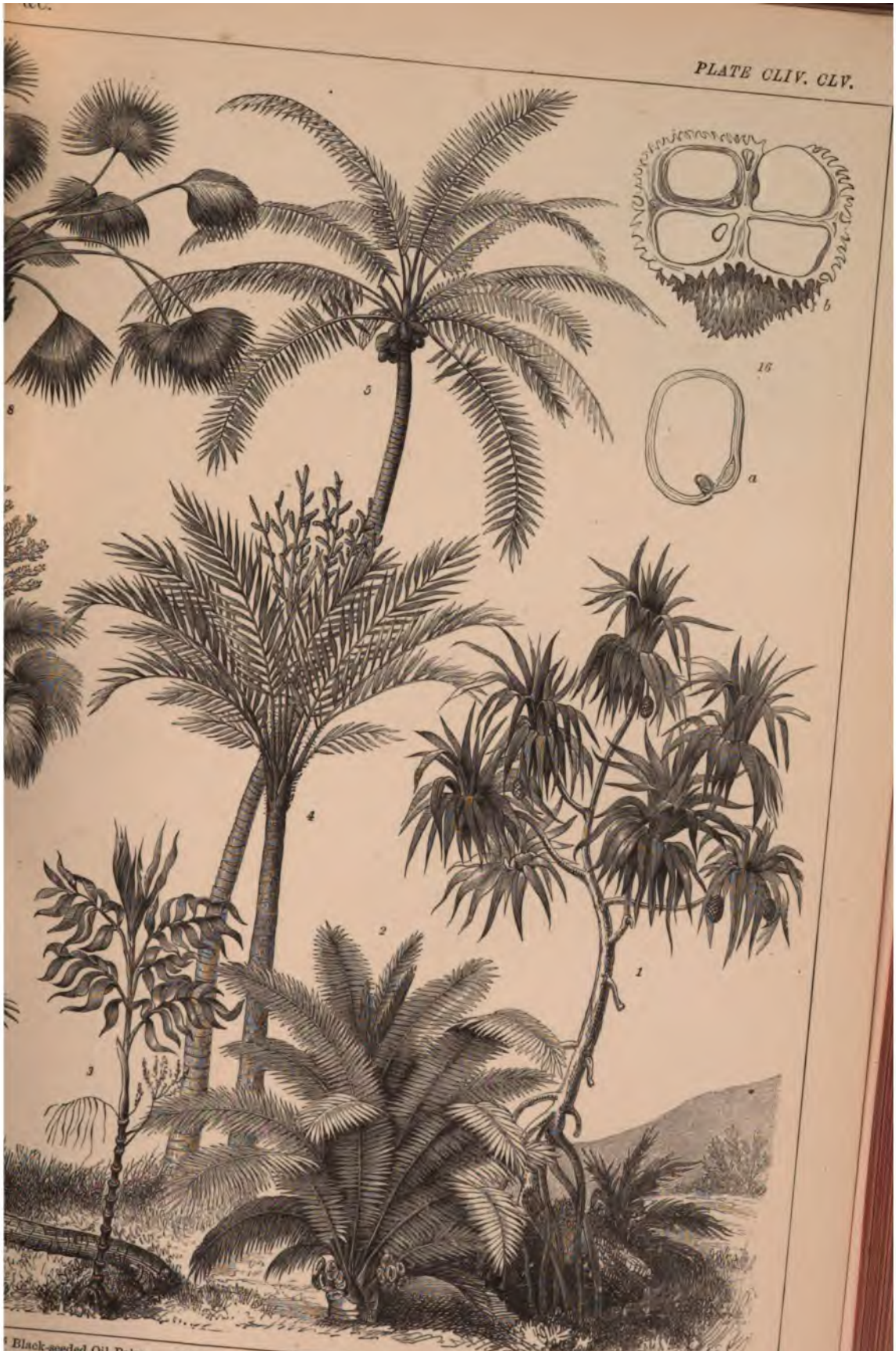


Fig. 1 Pandanus or Screw Pine. 2 Vegetable Ivory Palm or Phytelephas. 3 Chamædorea Schiedeana.
11 Calamus Equestris. 12 Fruit of Areca Triandra. 13 Fru



Black-seeded Oil Palm. 7 Taliput Palm. 8 Mauritia Palm. 9 Palmyra Palm. 10 Carnaüba Wax Palm.
Palm. 15 Fruit of Pandanus. 16 Fruit of Phytelephas Ruizii.

worms; and has been found peculiarly suitable for the construction of forts, as it closes, without splitting, on the passage of a ball.

PALMIPEDES. See NATATORES.

PALMISTRY. See CHIROMANCY.

PALMITIC ACID. This acid exists very widely distributed in nature. All the natural fats, whether of the animal or vegetable kingdom, contain palmitic acid, generally in combination with glycerin. Palmitic acid may be prepared by the saponification of such substances as palmitin, spermaceti, Japan wax, coffee beans, &c.; it forms a solid, colourless, inodorous body, which melts at 62° C.; it is insoluble in water, but is easily dissolved by hot alcohol or ether. Palmitic acid has the formula

$$\left.\begin{matrix} C_{16}H_{31}O \\ H \end{matrix}\right\}O;$$

it forms a series of salts called *palmitates*, and a series of ethers in which the hydrogen of the acid is replaced by alcoholic radicles. The most important of these ethers is *palmitin* or *glyceryl palmitate*, which is the substance present in those natural fats which yield palmitic acid on saponification.

PALM-OIL. See OIL-PALM.

PALMS, a natural order of plants, the pride of tropical climates, and which, more than any other, contributes to give a peculiar and imposing character to the vegetation of those regions. Their lofty, straight, and unbranching trunks, crowned at the summit by a tuft of large radiating leaves, give them an aspect entirely unique, and far surpassing all other endogens in majesty. Apart from the grandeur of their appearance, many of them hardly yield to any other vegetables in useful properties. The species are numerous, but are not well understood; and many fruits exist in collections which cannot be referred to known genera. They belong to the monocotyledonous division of plants, and have their parts arranged in threes, or one of the multiples of that number. The calyx has six divisions, the stamens are six in number; and the fruit consists of a berry or drupe, composed of a substance sometimes hard and scaly, but more often fleshy or fibrous, surrounding three, or usually a single, one-seeded nut. The stem is simple, or very rarely branching, and is sustained by a mass of fibrous roots at the base. Though usually attaining the stature of a tree, and sometimes ascending to a great height, in some species the stem rises only a few inches above the surface of the ground. The stem is cylindrical, but internally the fibres are arranged in fascicles, and not in concentric circles, as with exogenous trees. The centre is soft, while the circumference is firm and hard like horn. The stem is covered externally with the sheaths of the fallen leaves, or with their cicatrices, and is terminated by a tuft of pinnate or flabelliform leaves. From the midst of these arises a simple or branching spadix, on which the numerous small flowers are disposed, and which at first is enveloped in one or several spathes, or sheaths.—Many of the palms appear to be confined within narrow limits, and it has been remarked that, whenever a district is characterized by striking peculiarities of soil or climate, it appears to be inhabited by peculiar species. All the palms are not strictly confined within the tropics —a few inhabit the warm regions on their borders. The *Chamærops humilis* (see CHAMÆROPS) grows out of doors in the warmest parts of Europe. Some of the more useful and noted of the palm tribe are shown in Pl. CLIV.–CLV.

PALM SUNDAY, the last Sunday before Easter, on which Christ's entry into Jerusalem, when palms were strewed before him, is celebrated. Formerly a wooden ass, with the figure of Christ on it, was drawn on rollers in procession, because Christ entered Jerusalem on an ass. It is still celebrated with much solemnity by the Catholics, and branches are strewed in the churches.

PALMYRA (Hebrew, *Tadmor*, City of Palms), an ancient city of Syria, now in ruins, 140 miles E.N.E. of Damascus, lat. 34° 24′ N.; lon. 38° 20′ E. It was founded or enlarged by Solomon in the tenth century B.C. It is situated in an oasis of the Syrian Desert, with a ridge of hills to the west, and an extensive plain on the east. It is said to have been a bulwark of the Kingdom of Israel against the wandering tribes of the desert, and was an entrepôt for the trade between Damascus and the Mediterranean, from which it drew considerable wealth. Palmyra was little heard of in history until the time of the Roman Empire. It is mentioned as having been attacked by Mark Antony, who hoped to find in it the means to pay his troops; but the Palmyrians transported their goods beyond the Euphrates, and he was compelled to leave without accomplishing his object. During the earlier period of the empire it was independent, and carried on a considerable trade with Persia, India, and the Mediterranean. Subsequently, about 130, or according to other authorities later, it submitted to Rome, and accepted the title of a Roman colony. The protection of Rome against its neighbours the Parthians and the Persians was of value to it, while the yoke of so distant a mistress could not be heavy. It became the faithful ally of Rome in her wars against the eastern powers. During the reign of Gallienus (260–268) Odenathus, the ruler of Palmyra, rendered such effectual assistance against the Persians that that emperor gave him the title of Augustus, and recognized him as his colleague. Odenathus was succeeded by his widow Zenobia, to whom Palmyra chiefly owes its fame, and who took the title of Queen of the East. She was besieged in Palmyra by Aurelian, and compelled to surrender. On his departure the Palmyrians revolted, on which Aurelian returned and destroyed the city (A.D. 273). He permitted the inhabitants to rebuild it, but it never recovered its importance. The remains of Palmyra are chiefly of the Corinthian order, with the exception of the Temple of the Sun, which is Ionic. They are supposed to belong to the period of Odenathus and Zenobia. See ZENOBIA.

PALMYRA PALM (*Borassus flabelliformis*, not *Corypha umbraculifera*, is the true Palmyra). This tree enjoys a wide geographical distribution, ranging from the north-eastern parts of Arabia through India to the Bay of Bengal. It is found in the mountain districts of Ceylon at elevations of from 1680 to 2450 feet. In India and other parts of Asia it forms the chief support of 6,000,000 or 7,000,000 of population. The fronds give shelter to scores of animals by night and day, and afford a supply of refreshing moisture, the grooves of the petioles and the construction of the leaves being remarkably adapted to the conveyance and retention of rain; orchids, ferns, and banyans attach themselves to the stem. A poem in the Tamil languages mentions 800 uses to which it can be applied. The root is used for medicine, the young plants for food; the wood of the older plants is used for building purposes, and in Europe for umbrella handles, walking-canes, and fancy articles; the leaves are used for thatching houses, and when decayed for manure. Mats and other fancy articles, including writing-paper, are made of them. The plants arrive at maturity about the twelfth or fifteenth year; they then yield *toddy*, which is used both fermented and unfermented. It serves the Ceylon bakers as yeast, and large quantities of it are converted into vinegar for pickling purposes; but the most extensive manufacture from it is jaggery or palm sugar. The trees are drained of their juice for those

purposes for several months of the year. About 3 quarts of juice boil into 1 lb. of sugar. The fruit is sometimes eaten raw, but generally roasted. A full-grown palmyra is from 60 to 70 feet high; the trunk at the bottom is about 5½ feet in circumference, and about 2½ feet at the top. The wood becomes valuable for timber when the trees have reached an advanced age. They are in excellent condition when they have reached a century. The filling and dressing of them is an important industry in Ceylon. The name Palmyra-wood is frequently given in this country to other woods of a similar character. (Pl. CLIV.–CLV. fig. 9.)

PALOS, a small town of Andalusia, in Spain, where Columbus fitted out his ships, and whence he sailed on his first voyage for the discovery of the New World in 1492. Here also is the convent at the gate of which Columbus appeared as a poor stranger, and asked bread and water for his child. It is now a very insignificant place, not containing more than 800 inhabitants. See Irving's interesting account of his pilgrimage to Palos in company with a descendant of the Pinzon family in the appendix to his Voyages of the Companions of Columbus.

PALPI, the organs or appendages, consisting of stalked or jointed processes, found in connection with the mouth of many invertebrate forms, and which appear to be chiefly devoted to the exercise of the sense of touch, and probably in some cases of taste also. Thus in many insects palpi are borne by the 'maxillæ' or lesser pair of jaws (*maxillary palpi*), and by the 'labium' or lower lip (*labial palpi*). The labial palpi in butterflies become largely developed to form the cushion-like organs by which the elongated proboscis or tongue is protected when at rest. In Bees, &c., the labial palpi are of great relative length. In *Arachnida* (Spiders, Scorpions, Mites, &c.) the maxillary palpi are largely developed. In the Spiders these organs in the males are concerned in reproduction, and in the females they are terminated by hooked claws. In the Scorpions the same structures form powerful nipping-claws or *chelæ*. In the higher Crustaceans (Lobsters, Crabs, &c.) certain of the jaws bear palpi. The Lamellibranchiate Molluscs (Oysters, &c.) possess four fleshy processes known as 'palpi,' situated at the entrance of the mouth.

PALPITATION consists of repeated attacks of violent and spasmodic action of the heart, the pulsations of which are sensible to the patient, frequently distressingly so, and sometimes even audible. Its attacks are commonly sudden, but it often subsides gradually. Palpitation is usually classed as either functional or symptomatic. When it arises from organic disease of the heart it is called symptomatic; when there is no organic lesion, but only the function of the heart is disturbed, it is called functional. The classification is not perfect, for if the heart is not diseased it is evident the palpitation must be symptomatic of disorder elsewhere. It is better, therefore, to call it symptomatic, either first of organic disease of the heart, or, secondly, of other disorders of the system. The distinction of organic disease from nervous or other causes of palpitation is a matter of some difficulty, requiring careful and continuous observation, and must be done by the physician. The general disorders which may give rise to palpitation are very numerous, and must be treated according to their respective nature. They include over-exertion or protracted mental emotion; excessive use of alcoholic and other stimulants, including tea, coffee, &c.; sexual excesses and derangements of the sexual or urinary organs; anæmia or poverty of blood, and waste of other secretions; pressure from tight-lacing or other accidental causes, derangements of the stomach and bowels, hysteria, and in short whatever tends to disturb the nervous system. The determination of any of these numerous disorders towards palpitation of course depends upon the habit of body of the patient; it is most frequent at a comparatively early age, in the first decade after puberty; and females, from their greater nervous susceptibility, are more subject to it than males.

PALSY, PARALYSIS, a nervous disease, known by the loss or diminution of the power of voluntary motion, and sometimes of sensation, in one or several parts of the body. (See NERVOUS DISEASES.) It appears under different forms: sometimes it attacks the whole system, at others it affects one side of the body (*hemiplegia*), and at others a single member. The causes of palsy are numerous, but their mode of action is not clearly ascertained. The action of cold on the body in a heated state, a violent physical or moral excitement, or the suppression of an ordinary evacuation, sometimes produces it. The introduction of metallic substances, particularly lead or copper, into the system, often brings on incurable palsy. The paralysis of the vital organs is attended with immediate death, and when the head is attacked the memory and judgment are often impaired.

PALUS MÆOTIS. See AZOPH.

PAMLICO SOUND, a shallow lagoon, United States, on the south-east coast of North Carolina. It is 80 miles long, from 8 to 30 miles wide, and separated from the ocean by long, narrow, sandy islands. It receives the Tar and Neuse, and on the north communicates with Albemarle Sound.

PAMPAS, a name given to some of the vast plains of South America, particularly—1. The plains stretching from Tierra-del-Fuego on the north, through Patagonia and part of La Plata, over 27° of latitude, or 1900 miles, where they meet El Gran Chaco (see GRAN CHACO); and from the eastern slope of the Andes to the shores of the La Plata and Atlantic—of an extent so great that while their northern margin is bordered by palm-trees, their southern extremity is almost continually covered with ice or snow. Immense portions of this great plain, particularly north of the Colorado, and extending for 1000 miles east to west, are nearly as level as the sea, and without a stone or any other object except a solitary tree (the ambu), which is seen at vast distances rising like a great landmark.—2 (-DEL-SACRAMENTO), vast plains in the north-east of Peru, covering an area of about 60,000 square miles. They are traversed from south to north by the Ucayale, and though in parts almost without trees, are in others covered with immense and magnificent forests. Several parts of them have been brought under cultivation, but in general they remain in a state of nature, and are roamed over by various tribes of Indians.

PAMPAS-GRASS (*Gynerium argenteum*), a grass which grows in the pampas in the southern parts of South America. It has been introduced into this country as an ornamental plant. It has panicles of silvery flowers on stalks more than 10 feet high, and its leaves are from 6 to 8 feet long. The male and female flowers are on separate stalks. See GRASSES.

PAMPHLET, a word of uncertain origin, by some referred to the French *par un filet*, corresponding with the French *brochure*, from *brocher*, to stitch; according to others the second syllable is derived from the Italian *filato*, a sheet, from *filar*, and that from the Latin *filum*, a thread. A pamphlet, as is well known, is an ephemeral publication, occasional and not periodical, commonly discussing some question of public or special interest at the time. There are thus two distinct classes of pamphlets, the one addressed to the general public, and discussing some question of immediate though probably of temporary interest. Political pamphlets form the type

of this class. The other is addressed to a special class of readers, and discusses something connected with their particular interests or pursuits. Pamphlets of both classes are now to a great extent superseded by the opportunities of discussion afforded by regular periodical literature. Their day as an influential branch of politics or literature may be said to be over, and it is symptomatic of this change that a pamphlet now rarely pays in a mercantile point of view. They still, however, serve many important uses. Pamphlets have at various times since the introduction of printing exercised a very important influence, especially in this country, and in general in all times of political and religious excitement pamphleteers have been both numerous and vehement. They have comprised all sorts of men from scholars and men of genius to the most vulgar and venal of partisans. The history of pamphlets is thus a matter not devoid of interest or importance, but it does not yet appear to have met with a competent historian. One laborious writer on the subject, Myles Davis, is referred to in D'Israeli's Curiosities of Literature.

PAMPHYLIA, a country of Asia Minor, consisting of a narrow strip of coast lying to the south of Pisidia, and between Cilicia on the east and Lycia on the west, in a bay produced by the projection of the coasts of these two countries, called the Pamphylius Sinus. It was settled after the Trojan war, according to Pliny, by a leader called Mopsus, from whom it derived the name of Mopsopsia. The country is mountainous, the ramifications of Mount Taurus extending to within a few miles of the coast, or even to the coast itself. The name is used somewhat indeterminately, the Greeks sometimes restricting Pamphylia to the strip of coast a few miles in width extending from Olbia to Ptolemais; the Romans sometimes extending it inwards to the country beyond Mount Taurus. The inhabitants consisted of aborigines, Cilician emigrants, and Greeks. Pamphylia never attained any political importance. It was subject successively to Persia, Macedonia, Syria, and Rome, although some Greek colonies for a time maintained their independence.

PAMPLONA, or PAMPELUNA (anciently *Pompelo*, or *Pompeiopolis*), a city of Spain, and capital of the province of Navarre or Pamplona, and of the ancient Kingdom of Navarre, situated on the Arga, in a plain near the Pyrenees, 78 miles north-west of Saragossa, 197 north-east of Madrid. The town is strongly fortified, surrounded by walls, and has three handsome squares, the Plaza de Castillo being one of the finest in Spain; a viceregal palace and a modern governor's palace, a cathedral, dating from the end of the fourteenth century; a number of monasteries, four hospitals, an episcopal seminary, a gymnasium (*instituto*), with a natural history collection, a library, and a small botanic garden; a normal school for teachers, a school of mathematics and design, medical college, a theatre, baths, a bull-ring, and some fine promenades. The streets are for the most part straight, well-paved, and clean. The public fountains are supplied by a magnificent aqueduct nearly 12 miles in length, carried through tunnels for upwards of 3 miles, and in one portion over ninety-seven arches 35 feet in span and 65 feet in height. It is situated in a fertile and well-cultivated country, but has few manufactures. It is a town of great antiquity, said to have been founded or rebuilt by Pompey, and has had an eventful history. It was fortified by Vauban. It is the residence of a captain-general, and of a bishop, and is the seat of an *audiencia* or superior court, and of other courts. Pop. 25,630.

PAN, an Arcadian rural divinity, son of Zeus or Hermes and a nymph, or of Penelope. He is represented as old, with a crooked nose, two horns, pointed ears, a goat's beard, goat's tail, and goat's feet, with a pipe cut from a reed into which the nymph Syrise, whom he loved, had been transformed, and carrying a crooked shepherd's staff. He was originally worshipped in Arcadia, and his worship was first introduced into Athens after the battle of Marathon, in which it was pretended that he had assisted the Athenians. This shepherd god was afterwards made the all-supporting god of nature, and personified the universe (*to pan:* compare Servius on Virgil, eclogue ii. 31). He was also introduced into the earlier fables, as in that of the battle of the Titans. He distinguished himself in musical contests, and by playing on the pipe, which he invented, and with which he contended for the prize with Apollo. Midas, being the judge, awarded it to Pan, for which Apollo punished him by giving him ass's ears. Some appear to have honoured him also as the inventor of the flute of reeds. Pan is the protector of the herds at pasture, of wild beasts, of fishes, and takes care of the bees of the husbandman, on which account milk and honey were offered to him. Evander is said to have introduced his worship into Italy. From Pan comes the expression *panic fear*. He was supposed to appear to travellers, and startle them with sudden terror. According to Polyænus Pan saved the army of Bacchus from great danger by a wild scream, a thousand times repeated by the echoes of the woods and rocks. In the battle of the Titans Pan terrified the enemy by blowing in a sea-conch. The Romans identified Inuus Faunus with Pan.

PANAMÁ, or ISTMO, one of the United States of Colombia, occupying the isthmus (called the Isthmus of Panamá or Darien) which forms the link between North and South America, and separates the Atlantic from the Pacific Ocean. It has the shape of an arc, curving round from east to west for about 300 miles, with a breadth varying from 30 miles to 70 miles, and presenting its convex side to the Caribbean Sea, while its concavity is occupied by the large Bay of Panamá. This bay, which at its mouth is 135 miles across, and which penetrates inland about 120 miles, has, for the most part, low and swampy shores, noted for their unhealthiness; contains numerous islands, particularly on its east side, where the group called Pearl Islands covers about 400 square miles; and is indented by several harbours, of which those of Panamá in the north and San Miguel in the east are the best known. On the north or convex coast the most remarkable indentation is the Gulf of Darien, near its eastern extremity; on the same side there are also Port Escoces, and in its immediate vicinity Caledonia Bay; and Limon or Navy Bay, a little east of Chagres. In approaching the north coast from the Atlantic a range of lofty heights is seen, stretching apparently in an unbroken chain at a short distance from the shore; and it was long supposed that the barrier thus presented was characteristic of the whole isthmus, and precluded the idea of forming great thoroughfares across it to accommodate the traffic of the two oceans. It is now known, however, that a large part of the isthmus consists of low hills, valleys, and flat or undulating plains, watered by considerable streams, generally well covered with excellent timber, and capable of yielding all the more valuable tropical productions in tolerable abundance. A communication between the oceans on the two sides of the isthmus of Panamá has been effected by a railway opened in 1855, carried in a south-east direction from Aspinwall on Limon or Navy Bay to Panamá. It had long been felt, however, that to meet the wants of the mercantile world the construction of a ship canal that would unite the oceans was absolutely necessary.

Various schemes were proposed, but nothing practical was effected until the celebrated French engineer M. de Lesseps brought forward a proposal to construct a canal running for the most part close to the present railway. The ground along the route chosen nowhere rises higher than 287 feet, and for the most part does not exceed 160 feet in height. In 1879 the Interoceanic Canal Company was formed for the carrying out of this scheme, which was estimated to cost £24,000,000. The excavation of the canal commenced in 1883 on various sections of the line, and the operations have been carried on by 15,000 men, aided by numerous dredgers, steam excavators, and all kinds of improved machinery. The amount of material excavated in the month of Jan., 1884, was estimated at nearly a million cubic metres, and it is expected that eighteen and a half millions will be removed in 1884 and twenty millions each following year till its completion, the date of which is given by M. de Lesseps at 1888. A new town called Christophe Colomb has already been established, and will be the future port of entry of the canal. The Atlantic coast of the isthmus was discovered by Columbus in 1502; but the short distance across it was not ascertained till 1513, when Vasco Nuñez de Balboa, governor of Darien, set out on an exploring expedition, and from the top of a hill obtained the first view of the Pacific. For an account of the Scotch settlement once attempted on the Isthmus see DARIEN SCHEME. Pop. 224,582.

PANAMA, a city belonging to the Republic of Colombia, capital of Panamá, on the south coast of the Isthmus of Panamá, at the head of the bay of same name, on the Pacific, and connected by railway with Aspinwall on the Caribbean Sea. It lies on a tongue of land extending a considerable distance out to sea, and the principal streets extend across the peninsula. The buildings, mostly in the old Spanish style, are of stone, generally substantial, and the larger have courts or patios. The public edifices comprise a beautiful cathedral, five convents, a nunnery, and a college. The harbour is protected by a number of islands near the mainland. There is good anchorage under them all, and supplies of ordinary kinds, including excellent water, may be obtained from most of them. It has some trade in native produce with South America, and exports hides, shells, coffee and gold-dust to Europe; but is now chiefly important as a station on the route to California, and for the mails between Great Britain and various ports on the Pacific Ocean. The site of the old city of the same name is about 3 miles east from that of the present. Pop., consisting of a mixed race, 20,000.

PANATHENÆA, a festival celebrated at Athens in honour of its tutelary deity Athena. Erichthonius, who instituted it (according to some Orpheus was the founder), called it *Athenæa;* but when Theseus united the inhabitants of twelve districts into a city the festival received the name Panathenæa (from *pan*, all), because it was thenceforth solemnized by all the tribes of Athens. The Panathenæa were distinguished into the greater and the less, in both of which three kinds of games were exhibited, conducted by ten presidents (*athlothetæ*). On the first day were races with torches in the Ceramicus; on the second, gymnastic exercises, and imitations of naval fights; on the third, contests of music and declamation, and dramatic representations. An olive crown from the groves of Academus and a vessel full of sacred oil were the rewards of the victor. Then followed the sacrifices and the sacrificial feast. The greater Panathenæa, celebrated in the third year of each Olympiad, were distinguished from the less (celebrated yearly) not only by their greater splendour and longer continuance, but particularly by the solemn procession, in which the *peplus*, a sacred garment consecrated by young virgins, and made of white wool and adorned with gold embroidery, representing the battle of the giants, was carried from the Acropolis into the temple of the goddess, whose ivory statue was covered with it. The *peplus* was also used in the Panathenæa as the sail of a ship, which was moved through the streets by secret machinery, and accompanied by a solemn procession. This festival was so holy that criminals were released from the prisons on the occasion of its celebration, and gold crowns were conferred on men of distinguished merit.

PANCAKE. The following is Soyer's recipe:—Break two to four eggs into a basin; add four tablespoonfuls of flour, two teaspoonfuls of sugar, and a little salt; beat the whole well together, adding by degrees half a pint of milk, or a little more or less, so as to form a rather thick batter; next add a little ginger, cinnamon, or any other flavour at will; lastly, put them into the pan, and when set, and one side *brownish*, lay hold of the frying-pan at the extremity of the handle, give it a sudden but slight jerk upwards, and the cake will turn over on the other side. When the other side is brown dish up with sifted sugar, and serve with lemon. When pancakes contain fruit, fish, meat, or poultry they are called *fritters*. Pancakes are regarded as specially the dish to be eaten on Shrove Tuesday.

PANCREAS—the sweet-bread of animals—one of the viscera of the abdomen. Its situation is behind the stomach, lying in a nearly straight manner across the spinal column, at the level of the first lumbar vertebra or that of the loins. The 'head' and broader portion or right extremity lies within a loop or curve formed by the duodenum or first portion of the intestinal tract; whilst the 'tail' or narrower part or left extremity is in apposition with the spleen. The pancreas measures on an average about 8 inches long; in thickness it may vary from ½ inch to 1 inch; its average breadth being about 1½ inch. Its weight is from 3½ to 6 oz. The splenic vein and splenic artery pass along its upper border, whilst the lower border rests upon the transverse portion of the duodenum. Behind, the pancreas is in contact with the vena cava inferior, with the kidney of the left side and its supra-renal capsule, and with the portal vein at its commencement. The duct (canal of Wirsung) or excretory tube of the pancreas passes from the right to the left of the structure in the front, and at the lower or inferior edge of the gland. This —the pancreatic—duct, by which the secretion of the gland is conveyed to the intestine to be mixed with the food as it passes along that tract, terminates in the descending portion of the duodenum and on its posterior aspect. The duct of the pancreas thus opens into the intestine in close proximity to the opening of the common bile duct. The pancreatic duct possesses an outer or fibrous and an inner mucous coat. Its average diameter at its intestinal end is about that of an ordinary goose-quill.

The minute or intimate structure of the pancreas is essentially that of a salivary gland. The Germans indeed term it the salivary gland of the abdomen, and its secretion—the chemical composition of which will be presently described—shows a close resemblance to saliva in all essential respects. The entire organ consists of numerous lobes, which are in turn made up of smaller lobules, the latter being connected by areolar tissue and by blood-vessels. The essential structure may be determined by the examination of a single lobule, when such a structural element may be seen to be composed of closed vesicles or sacs opening into a duct common to the sacs of the entire lobule. The walls of the secreting vesicles are formed of a thick outer net-work of capillary blood-vessels, of

a middle layer—the basement membrane—and of an inner epithelial lining. The pancreas chiefly obtains the supply of blood necessary for its nutrition and for its secretory purposes from the splenic and superior mesenteric arteries. Its blood is returned by the pancreatic veins which open into the splenic and superior mesenteric veins. The lymphatics of the sweet-bread join the lumbar lymphatic or absorbent glands, and its nervous supply is derived from the splenic plexus of nerves.

The *pancreatic juice* is a clear, ropy fluid. It has an alkaline reaction, contains a small amount of mineral salts, consisting chiefly of sodium chloride, mixed with sodium and potassium sulphates; sodium, calcium, and magnesium phosphates; calcium carbonate, and traces of iron. This juice contains a kind of protein substance allied to casein, various extractive matters, and fat.

The functions of the pancreatic juice or fluid are chiefly, like those of the saliva, devoted to the conversion of the starchy elements of the food into sugar. The acid of saliva being wanting in the pancreatic juice this latter fluid is even more effective than the saliva in its action. It forms an emulsion with oils or fatty matters, and the microscopic globules of such an emulsion are readily absorbed by the villi of the intestine. Indeed a chief part of the pancreatic function is that of thus assimilating fats, the bile of itself being incapable of digesting fats. On albuminoid matters the pancreatic juice also appears to possess a distinct action; and Flint says that muscular fibre, partly digested by the gastric juice of the stomach, is in turn more completely assimilated by the secretion of the sweet-bread.

In bears, dogs, and many other Mammalia the pancreas exhibits a structure more complicated than that found in man. In Rodents, in the Hedgehog and Flying Fox, &c., it exhibits a branched or arborescent structure. In the horse and pig it is trilobular. In the ox it is invariably, and in man sometimes double. In birds the sweet-bread is narrow and elongated, lies within the duodenal loop, and possesses usually two ducts. The pancreas of Reptiles and Amphibia presents no features worthy of special remark. In certain fishes a pancreas exists, but its place in the generality of fishes appears to be filled by a greater or less number of cæcal appendages (the *pyloric cæca*), which are attached to the pyloric or hinder aspect of the stomach. In the sword-fish these cæca become aggregated together so as to form a pancreatic-like structure. In the lancelet no pancreas or homologous organ exists. In Invertebrata certain organs connected with the digestive system have had a pancreatic function assigned them. In Gasteropodous Molluscs it makes its first definite structural appearance as a long glandular sac.

PANCSOVA, a town, Hungary, Temesvar, 8 miles E.N.E. of Belgrade, at the confluence of the Temes with the Danube. It is well built, has Roman Catholic and Greek churches, a mathematical and other schools, and contains among its inhabitants a great number of Greek merchants, who carry on an important trade with Turkey. Pop. 17,127.

PANDA, or WAH (*Ailurus fulgens*), a carnivorous mammal, allied to the Bears, and included in the Plantigrade section of the order Carnivora. This animal is included in the Ursidæ or Bear family, and is found in Northern India, in which country it represents the racoons of the New World. It averages a large cat in size. It is coloured a deep or chestnut brown on its upper parts and black on the under parts. The face and ears are coloured white. The tail is reddish-brown marked with darker rings.

PANDANACEÆ, the scientific name for the Screw-pine family of plants. They are monohypogynous endogens, with numerous naked or scaly flowers, arranged on a spadix covered by many spathes, with stalked anthers, loose seeds, and a solid minute embryo. The flowers are unisexual or polygamous; perianth wanting, or consisting only of a few scales. The male flowers have numerous stamens, which consist of filaments with simple anthers, two or four celled. The female flowers have the stigmas sessile, in number equal to the carpels, ovaries united in parcels, one-celled; the ovules may be numerous or solitary. The fruit is either in parcels of fibrous drupes or in berries. The seeds are solitary in the drupes, but numerous in the berries. The leaves are long, imbricated, and amplexicaul. The order is divided into two sections, *Pandaneæ* and *Cyclantheæ;* the first with undivided leaves and no perianth, the second with fan-shaped or pinnate leaves, and flowers having a few scales. They are tropical plants, and abound in Mauritius, where they are found in sandy plains, with strong aerial roots, which enable them to subsist in such situations. The Cyclantheæ are American, and are found in Peru and Brazil.

PANDECTS (from Greek *pandektēs*, all-containing), a collection of laws, systematically arranged, from the works of Roman writers on jurisprudence, to which the Emperor Justinian (by whose command the collection was made) gave the force of law, A.D. 533, at the same time declaring all the writings of the jurists and collections of the law which had previously been authorities of no force. They were also called *digesta* (from *digerere*, to arrange), because they were a collection of the scattered contents of many works. See CIVIL LAW.

PANDIT, or PUNDIT, a learned Brahman; one versed in the Sanskrit language, and in the sciences, laws, and religion of the Hindus.

PANDOORS, the name formerly given to the Servian or Raitzian foot-soldiers coming from the mountains in the neighbourhood of the village Pandur, in the county of Sol, in Lower Hungary. They were at first irregular troops. In 1750 they were made regular troops. They were formerly dreaded for their savage mode of warfare.

PANDORA (from *pan*, every; *dōron*, gift), in Greek mythology, the first woman; so called because she received gifts from all the Olympians. Prometheus, driven from Olympus by Zeus, had formed man, and animated him with fire stolen from heaven. The indignant father of the gods determined to punish the offence. He commanded Hephæstus to form a woman of clay, equal to the goddesses in beauty and grace, and to give her life and the power of speech. The god executed the command. According to other accounts she was the creature of Prometheus, and the gods came down to see her, and conferred their gifts on her. Athena instructed her in all works of female skill. Aphrodite endowed her with beauty and fascination. Hermes inspired her with a desire of pleasing, and taught insinuating words. Athena carried her thus equipped into the assembly of the gods, and all admired the work. She was called Pandora, because each god had given her some gift which was to prove fatal to man. According to later accounts Zeus gave her a box containing all the blessings which the human race was to inherit; but all these blessings were winged, and on her opening the box they flew away. Epimetheus, her husband, had been warned by his brother Prometheus not to receive any present from Zeus; but the charms of the virgin overcame his caution. When Epimetheus, or, as some say, Pandora, had out of curiosity raised the cover of the box, which a divine command had forbidden them to open, Hope alone remained at the bottom of the box, which was suddenly closed by the rash opener.

PANEGYRIC, a eulogy either written or spoken, the object of which is to give a favourable representation of some person or thing. Historical truth is so far rendered subordinate, that the author exaggerates the excellence of the subject to inspire others with his own admiration. In the Grecian republics this department of oratory was much cultivated, and the panegyric of Isocrates, notwithstanding its artificial elaborateness, is a master-piece of finished writing. In Roman literature the best which we possess is the panegyric of Pliny the younger on Trajan, both in classical style and in rhetorical arrangement. The later Roman panegyrists of the third and fourth century are valuable only to the historian who is seeking for facts. Among the moderns the French have something similar in their *éloges*.

PANEL, a schedule or roll of such jurors as the sheriff returns to pass upon any trial; and *impanelling* a jury is returning their names in such schedule of parchment. In Scottish law the prisoner at the bar is the *panel*.

PANEL, in joinery, is a tympanum or square piece of thin wood, sometimes carved, framed, or grooved in a larger piece, or between two upright pieces and two cross pieces.

PANGOLIN, the name applied to the Scaly Ant-eaters (Manidæ), forming a family of the Edentate order of mammals. These forms are confined in their distribution to the Old World. They occur in Southern Asia and Africa; and from the fact that the body is invested by a covering of imbricated scales of horny material, the term *Squamata* is sometimes applied to the Pangolin group. The entire body is covered by these strong plates, which, regarded in a general way, and with reference to their homologies and development, correspond with nails, hairs, and other epidermic appendages. These animals possess the power of rolling themselves up into a ball-like form, after the fashion of the common hedgehog, and of thus protecting themselves securely within their horny armour. The tail is also invested with scales, and attains a considerable length. The legs are of short conformation; the feet being each provided with four or five toes, which terminate in strong curved claws, of service to the animals in burrowing. No clavicles or collar-bones are developed. The jaws are entirely destitute of teeth. The salivary glands are excessively developed, and extend backwards to the chest; and the tongue is also of great length, and capable of being protruded from the mouth to a considerable extent. The saliva, being of glutinous character, aids the tongue in the capture of the insect-prey. The long claws of the fore-feet in these forms are bent inwards, and the animal thus walks on the upper or dorsal surfaces of the toes. The hinder part of the body is supported on the broader soles of the hind feet. The food consists of ants, and various other insects. The average length of body, from the snout to the tip of the tail, is from 3 to 4 feet. No external ears are developed, and the eyes are of small size. Two familiar species of this genus are the *Manis pentadactyla* (Short-tailed Manis, see Pl. XXXVI.–XXXVII. fig. 14), found in India; and the *M. tetradactyla*, occurring in Africa.

PÂNINI, a celebrated Indian philologist, probably the oldest writer on grammar whose works are extant, although he quotes the names of several grammarians who were his predecessors. He is reckoned among the sages of the Purânas. The time at which he lived is uncertain, and nothing is known of his life. Goldstücker supposes that he lived not later than the sixth century B.C. His grammar is in eight books, divided into chapters, and containing 3996 rules or sutras. Its method is wholly different from that of European grammarians. The separate chapters treat the various phenomena of language as they appear in all the various forms of speech; hence the work is strictly a philosophical treatise, requiring to be studied as a whole, and not conveying sectional information in a form classified for reference according to the European model. He is the first who has classified the philological principles of grammar, as distinguished from the mere forms or parts of speech. The grammar of Pânini has been often annotated. Its chief critics are Kâtyâyana and Patanjali. His style is of an oracular brevity, which renders it highly obscure. The Sutras of Pânini, with extracts from the Vârttikas of Kâtyâyana and the Mahâbhâshya of Patanjali, were published at Calcutta in 1809; and at Bonn in 1839–40, with notes by Dr. O. Böhtlingk. See also Goldstücker's Pânini, his Place in Sanskrit Literature.

PANIPUT, a town of India, in the province and 50 miles north by west of Delhi; 4 miles in circumference, and formerly surrounded by a brick wall. It imports salt, grain, and cotton cloths. Principal export, coarse sugar, which is produced in the vicinity. Pop. 22,612.

PANNONIA, the ancient name of a district of Europe, formerly inhabited by a race or collection of tribes called Pannonians. The origin of the Pannonians is uncertain. They were probably composed partly of Celts, and partly of Thracians. Little is known of their history until they were conquered by the Romans. Pannonia afterwards continued a part of the Roman Empire until its dissolution. It afterwards fell into the hands of the Ostrogoths, who were succeeded, A.D. 500, by the Longobardi, and these (568) by the Avari. It fell into the hands of the Magyars or Hungarians about 900. The country was bounded north and east by the Danube, south by Illyricum and Mœsia; west by Noricum, from which it was separated by Mount Cetius, and by Italy, which was divided from it by the Julian Alps. It comprised the eastern parts of Austria, Carinthia, Carniola, the part of Hungary between the Danube and the Save, Slavonia, and parts of Croatia and Bosnia. It was much less fertile than in modern times, being greatly more wooded; but large forests were cut down by some of the emperors, as Probus and Gallerius, who did much to improve the country. It was, however, well peopled, and sent 100,000 armed men into the field against the Romans. The conquest of the Pannonians was begun by Octavianus, during his triumvirate in B.C. 35, and afterwards completed by his general Vibius. The Pannonians, with other Illyrian tribes, revolted against the Romans on the breaking out of the war with Maroboduus, king of the Marcomanni. They were finally subdued by Tiberius, A.D. 8, and Pannonia became a Roman province. In the second century it was divided into two provinces, Superior and Inferior, separated by a straight line from Arabona in the north to Servitium in the south, the former constituting the western, the latter the eastern of these divisions. In the fourth century a portion of Pannonia Inferior, lying between the rivers Raab, Danube, and Drave, was erected into a second province, named Valeria. Pannonia had numerous towns, of which Vindobona (Vienna) was the chief. The Romans had a strong fleet there, and, particularly during the later period of the empire, kept a powerful army in Pannonia.

PANORAMA (from *pan*, all, the whole, and *orama*, view), a perspective view of a town or natural scene, projected on the plane of the horizon, invented by Robert Barker, an Englishman, in 1787. The panorama may be considered as the triumph of perspective. The artist from a high point must take an

accurate plan of the whole surrounding country, as far as the eye can reach. Truth of representation and closeness of imitation are the great objects to be aimed at in panoramas, and the delusion must be promoted by the manner in which the picture is put up and lighted. It is circularly disposed round the walls of a rotunda, so that the spectator who is stationed in the centre, and prevented from approaching too near the painting by a railing, finds himself, as it were, on the spot from which the view was taken. The light is admitted from above, without dazzling the spectator, from whom the aperture by which it enters is also concealed; and as he sees no end to the picture, in which all the parts are delineated in their true proportion to the whole, and with the natural colouring, the illusion is complete. Robert Fulton introduced the panorama into France, and panoramic views of a great number of cities and natural scenes have been exhibited within the last fifty years in Europe and America. See DIORAMA.

PANSLAVISM, a general name for the efforts of the Slavonic races in Europe after union. These comprise a literary, a sentimental, and a political movement. The last, embodied in the watchword 'Slavonia for the Slaves,' has comprised several different projects, as that of an independent state, or of a union under Russia or Austria. An anonymous work, the European Pentarchy (Leipzig, 1839), and the writings of A. Gurowski, made a considerable impression in favour of a union under Russia; while later events favoured the Austrian headship; but none of these projects ever possessed a reasonable chance of realization. The mere fact that the Slavonic race comprises nations so bitterly hostile as Russia and Poland, not to speak of geographical and political difficulties, and of such diversities of religious creed as are contained within the range of Christianity and Mohammedanism, made any attempt to unite the scattered elements of such a race in a voluntary political union impracticable. For similar reasons little more real progress has been made with the attempt to promote a literary union. This was specially advocated by Johann Rollar, in his work Über die literarische Wechselseitigkeit zwischen den Stämmen and Mundarten der slawonischen Nation (Pesth, 1831). There remains the sentimental union, and this, though seemingly the most vague and impracticable, is the only one which ever possessed, or is likely to retain, any real vitality and importance, The sentiment of nationality seems to be deeply rooted in the human mind, and wherever any large mass of men are united by language and traditions, as the representatives of a common race, without possessing a distinct political autonomy, the desire for some practical demonstration of their union must exist, and where this desire coincides with political discontents it naturally assumes a political aspect. It is to this cause unquestionably that we are to attribute the communication from one to any other of the many separate masses of Slaves living under different governments of the idea of a common nationality, and not to any real and practical sympathies among them. The sympathies which inspire this idea exist among those of the common nationality who live together and are known to each other, and the divergences between them and their distant relatives are overlooked. But while this sentiment remains, however impracticable may be its own aspirations, it has the important effect of maintaining an outstanding element of heterogeneous nationality, which is adverse to the political unity of the country where it is found.

The most important effort put forth towards the realization of a political union of the Slaves was in 1848, when, stimulated by the rival efforts at union of the German nations, and especially by the summons to Bohemia to send her full contingent to the German parliament, the Slavonic clubs summoned a congress of all the Slaves in the Austrian Empire, with a view to confer on the constitution of the empire. The congress met at Prague on 2d June. The various nations represented were classified in three departments: the first, consisting of the Bohemians, Moravians, Silesians, and Slovaks or Western Slaves; the Poles and Ruthenians forming the Eastern Slavonians; the Slovenians, Croats, Servians, and Dalmatians the southern division. Each of these divisions chose sixteen members, who formed a committee, with Palacky at their head, who drew up a plan of confederation and alliance among the various nationalities of the empire. The proceedings of the congress, however, which had to be conducted in German, as the only common means of communication, could not be brought to a formal conclusion, and the congress was interrupted by a Slavonic insurrection, which proved futile. Since 1866 renewed efforts have been made by the scattered Slavonians of Austria to form a union among themselves, in order to counterbalance the preponderance of the German and Magyar races. A Slavonic conference, numerously attended by foreign Slaves, was held at Moscow in 1867. Palacky and Rieger were present as representatives of Bohemia.

PANSPERMY, the name given to the doctrine of biogenesis, or that opposed to 'spontaneous generation' or abiogenesis. The panspermatists or biogenesists are so named from their belief that in organic fluids and in the atmosphere, minute germs or ova are suspended and contained; and that under favourable conditions these germs or ova become developed in infusions into living beings of animal and plant nature. The abiogenesists, on the contrary, hold to the belief that such lower forms of animal and plant life as appear in infusions are spontaneously developed from the matter of the infusions, through molecular processes, or in virtue of physical or chemico-physical laws. This latter opinion, therefore, holds that life or living beings may originate *de novo*, and without the pre-existence of parent germs or organisms—a statement denied by the panspermatists. The whole question is one of much interest, and is reviewed under the head of GENERATION (SPONTANEOUS).

PANTAGRAPH. See PANTOGRAPH.

PANTELLARIA, an island of the Mediterranean, 50 miles E.S.E. of Cape Bon in Africa, and 80 miles south-west of Sicily, of which it is a dependency; length, north to south, 9 miles; breadth, 6 miles. It is covered with mountains of volcanic formation; but is fertile, and presents several good roadsteads. The island contains a town of the same name, which forms a kind of semicircle round its harbour, and is defended by a castle, used as a state prison. Pop. 7011.

PANTHEISM (Greek, *pan*, all, and *theos*, god), in philosophy, the doctrine of the substantial identity of God and the universe. The doctrine stands midway between atheism and dogmatic theism. There seem to be only three ways in which philosophy can deal with the hypothesis of the existence of God, that is, of a being who is the cause or original sum of all being. It may deny his existence altogether. It may infer psychologically that there is a God, and proceed to the inference that he is the first cause of all things; but leave unexplained the nature of the relation between God as cause and other existences as effects. Finally, it may proceed to reason back from the effect to the cause, and show a necessary connection between them. The last process is the source and explanation of pantheism. The origin of the idea of a God with the theist and the pantheist is the same. It is by

reasoning upon ourselves and the surrounding objects of which we are cognisant that we come to infer the existence of some Superior Being upon whom they all depend, from whom they proceed, or in whom they subsist. The evidence of some unity in the variety of nature, as well, perhaps, as the determination in our own minds towards the conception of a unity pervading all the actual or conceivable varieties of being, contribute to the production of this conception. Any belief in a God, therefore, is founded upon the inference of an actual relation between God and the universe, and from this relation it follows that we must be able to learn something from the universe of what God is. As the effect, however, does not in point of fact afford us in all cases an adequate knowledge of the cause, it cannot reasonably be assumed that all that we see in the universe gives us equally accurate notions, or, indeed, that it always gives us any accurate notions at all of the Being to whom we suppose it all to be related. There are thus two distinct methods of procedure in reasoning from the known variety of the universe to the supposed unity of God. The psychological method, assuming that God is the author of what is most excellent in the universe, intelligence, concludes that he must be himself intelligent, hence it removes from the conception of God as the source of all being all that is inconsistent with the notion of intelligence, the purest in kind and the highest in degree that can be conceived of. It observes, moreover, that there is in the universe much that cannot on this hypothesis be supposed to be related to God in the way of similarity or identity. Thus, as a relation of dependence of some sort is a necessary part of the notion of deity, we get the conception of creation. The idea that God is the Author of all things, not by a process of inexorable development, but in the free and intelligent exercise of unknown powers, is the ultimate deduction of psychology, and beyond this it cannot go. It is possible to conceive of a free and intelligent Creator; but it is impossible to conceive of the works of such a Creator as necessarily bearing such a relation to himself, that they must by a process of exhaustive reasoning inevitably reveal the mode of their production, and the secrets of his power. The works of an intelligent Creator may abound in evidences of harmony and design, which may afford ample evidence of the unity of the worker, and thus the psychological hypothesis may be justified without attempting to explain the mode of creation, and there is nothing inconsistent with this hypothesis in seeking from existing phenomena all the explanations as to the mode of their origination which they may be capable of affording; but to assume that in these phenomena, apart from their relation to the manifestation of intelligence, is to be found the only or adequate account of their existence is to destroy the hypothesis.

Pantheism proceeds upon a different hypothesis. It assumes the identity of cause and effect, and the consequent adequacy of each effect, rightly interpreted, to indicate its cause. Matter, not less than mind, is with it the necessary emanation of the deity. The unity of the universe is a unity which embraces all existing variety, as proceeding from it in a way necessarily explicable by the result. Hence each existing thing contains all the explanation of its own existence which it is capable of receiving.

Psychological theism does not afford an adequate, or indeed any explanation of the origin of things, besides the postulation, which it considers itself justified in making, of an omnipotent Creator; but by the assumption which it makes of a necessary ignorance on our part it relieves us of much of the burden of explanation. Pantheism takes upon itself the whole responsibility of expounding the relation between God, the unknown unity, and the universe, the known variety; and as the former must be deduced rationally from the latter, the latter must have proceeded necessarily from the former. The differentiation between psychological theism and pantheism is thus contained in the distinction between the conceptions of creation and evolution, as the final explanation of the knowable cause of the whole phenomena of nature. The theistic conception of God is untrammelled by any condition except that of the possession of infinite intelligence, and of the attributes proper to intelligence, as power, wisdom, and goodness. The pantheistic conception is trammelled by the necessary evolution of all existing phenomena, hence the pantheistic conception of God is necessarily more complex than the theistic. It is the conception of a unity the idea of which is unattainable, in which good and evil, greatness and littleness, fate and freedom, and all other contradictions, together with all existing and inexplicable congruities, are combined.

The pantheistic conception, notwithstanding these difficulties, has manifest attractions for speculative minds; and it is no matter of surprise that philosophers in great numbers, of the highest reputation, of various schools, and belonging to all ages and countries, should have to a greater or less extent, and more or less consciously, embraced it. The diversity of development to which this extensive diffusion of so comprehensive a doctrine has led, and the unconscious infusion of pantheistic notions into creeds intended to be purely psychological, have been the cause of great difficulties in defining and differentiating this doctrine.

The earliest school of Greek philosophy, the Ionian, in as far as it admitted any theism, was essentially pantheistic; and to the same school of pantheism belong Epicurus and Lucretius in ancient, and Giordano Bruno in modern times. The atomic theory, or the origination of all things in conscious atoms, is the culminating theory of this school. The Sankhya of Kapila, one of the most celebrated Indian systems of philosophy, and in which probably originated the Buddhist religion, was the chief representative of pantheistic tendencies in the East. Kapila enumerates twenty-five first principles of things: of which the first (*mulaprakriti*) is matter; the second (*buddhi*), intelligence; the third (*ahankara*), self-consciousness. Speusippus, the sister's son and successor in the Academy of Plato, might be called an ultra-pantheist. He taught, what may possibly be considered the true logical culmination of the doctrine, that the Divine or Best is first indeed in rank, but is chronologically the last product of development. He defined happiness as the habit of conformity to nature. The soul, according to him, was a higher union of the arithmetical and the geometrical, or extension harmoniously shaped by number. The Stoics, differing widely from the school of Epicurus, may also be numbered among the adherents of pantheism. Their doctrine was that whatever is real is material. The universe as a whole possesses consciousness, and this consciousness is deity. The world undergoes a constant evolution, the elements of water, earth, and air being evolved out of fire, which again absorbs them, and the process recommences in an eternal cycle. The human soul and the deity, which are one in nature, act and react on each other. Intelligence, whether in man or the deity, they considered as consisting chiefly in force. Perhaps there is nothing which seems more opposed to pantheism than the mysticism of the Alexandrian school, and particularly of Plotinus, which makes of God so pure an abstraction, that even thought, without being separated from individuality,

cannot attain to it. Yet from the bosom of this school a prolific source of pantheism has arisen. Dionysius, the pseudo-Areopagite, a Christian philosopher of the Neoplatonic school, introduced it among his speculations, in which the particular is derived by a series of gradations, as genus and species from the universal. John Scotus Erigena, the founder of the scholastic philosophy of the middle ages, gave this speculation a realistic turn, making God the essence of the world, and the universal, the genus, the species, and the individual so many particular developments which actually succeed each other. Eckhart, a German philosopher of the beginning of the fourteenth century, also a disciple of Dionysius, and who is regarded as the father of German philosophy, taught some views which were developed in a pantheistic direction by some of his followers. Eckhart held that the works of creation were eternally in God in idea or conception; this was developed into a pantheistic doctrine of the eternal existence of ideas or types of all things. Giordano Bruno, like Epicurus and Lucretius, taught that monads are the elements of all existing things. God is the immanent cause of the universe. Power, wisdom, and love are his attributes; but he is the monad of monads, the minimum because all things are external to him; the maximum because all things are in him. He produced the worlds freely, but by an inner necessity of his nature. The worlds are nature realized; God is nature working. Stars are moved by the souls that reside in them. God is in all things, as being in things that exist, or beauty in objects that are beautiful.

No modern pantheist has acquired a greater renown than Spinoza, probably because none has developed his doctrines into a system so comprehensive, or with a logic so rigorous. A disciple of Descartes, he founds upon that master's definition of cause a system in which he develops the relation of God to the universe in a series of propositions, graduated like a succession of consequential demonstrations in mathematics. According to Spinoza the essence of God is existence, and he has two fundamental attributes, extension and thought. All things which exist are modes of God's attributes. Their existence is necessary, and all changes which take place in them, whether affecting intelligent or non-intelligent beings, are necessary. God alone is free, and he is free because he acts by an inner necessity, and is not controlled by any other being. It may be added that Spinoza combats the apparent inference from his doctrine, that the sum of things which exist is God. Things are diverse, complex, and limited, while God is one, simple, and infinite. They are not God, but only the necessary modes of his attributes. Among modern pantheists a place is also due to Leibnitz. According to him all souls are monads, or atoms containing active powers consisting in ideas. God is the primitive monad; all other monads are its fulgurations. Bodies, as plants and minerals, are aggregations of sleeping monads with unconscious ideas. The relations of the monads are purely mechanical, and their co-operation is determined by the theory of pre-established harmony. (See MIND, HUMAN.) Diderot recognized God in natural law, truth, beauty, and goodness; for Leibnitz's monads he put atoms, and gave them sense in place of ideas, which became thought in organized beings. Finally, the modern doctrine of evolution, when it assumes a transcendental form, and carries speculation as to the origin of things beyond the range of inferences founded on the observation of nature, is necessarily pantheistic.

PANTHEON (Greek, *pan*, all; *theos*, god), a temple consecrated to all the gods. The most celebrated Pantheon of ancient times was that at Rome, built during his third consulate, B.C. 27, by Vipsanius Agrippa, the favourite, and afterwards the son-in-law of Augustus, was situated in the Campus Martius, outside the city. It still exists in a half ruined condition. It is a circular edifice covered with a dome 135 feet in diameter, and the same in height. It is in brick, and is supposed to have been covered within and without with marble. The front which faces the north consists of a portico formed of sixteen monolithic columns of gray granite, supporting a triangular entablature, under which is the inscription: M. Agrippa. L. F. Cos. Tertium. Fecit. It was formerly ornamented with sculptures in bronze, which have been taken away. A second entablature rests upon, and in rear of the first. It is also void of sculptures. The vault of the portico was formerly covered with plates of gilded brass, ornamented with silver, which have also been removed, and the bronze gates in the centre, which occupied the only entrance to the temple, have been taken away by Pope Urban VIII. At each side of these gates was a niche, in which were placed the statues of Augustus and Agrippa. The interior of the temple is lighted from a circular aperture in the vault, 30 feet in diameter. Seven recesses, some circular, others triangular, in the walls of the edifice, were destined to receive the statues of the gods. The Pantheon has suffered severely from successive spoliations. From a restoration ordered by Septimus Severus, it seems already to have suffered from this cause in his day. Constantine carried many of its ornaments to Constantinople, and the barbarians assisted in completing its ruin. Pope Boniface IV. obtained permission of the Emperor Phocas to dedicate it to Christian worship under the patronage of Saint Mary of the Martyrs, and the niches of the gods were converted into chapels. Under one of them rests the remains of Raffael, in memory of whom it contains a statue of the Virgin, by Lorenzetto, called the *Madonna del Sasso*. Annibal Carracci was interred in the same chapel.

The Pantheon of Paris (Church of St. Geneviève) was built on a site occupied by a church dedicated by Clovis to the holy apostles, and which took the name of St. Geneviève, when the relics of that saint had been transported to it. This church was destroyed by the Normans, and replaced by the famous Abbaye de St. Geneviève. A new and sumptuous church was begun on the same site in fulfilment of a vow, by Louis XV., in 1764. The architect to whom he intrusted it was Jacques Germain Soufflot. He made it in the form of a Greek cross, with an entablature, dominating a peristyle, supported by twenty-two Corinthian columns, while, at the junction of the four arms of the cross he erected a dome similar to that of Saint Peter's at Rome. Soufflot died in 1780, before the work was completed, and it was continued by Rondelet, who was compelled to alter the supports of the dome, which Soufflot had put on pillars, to render them more solid. It was still unfinished in 1789, when, on the death of Mirabeau, the Constituent Assembly decreed that the church of Saint Geneviève should be set apart as the resting-place of the remains of the great men of the country. Mirabeau was decided to be the first to whom that honour should be awarded. The directory of the department of the Seine was instructed to have the church finished, and adapted to its new destination, and on its entablature was ordered to be put the following inscription—'Aux grands hommes la patrie reconnaissante.' The remains of Voltaire were transported to it 12th July, 1791. The name of Pantheon was first given it a few days afterwards, in a petition requesting that the remains of Jean Jacques Rousseau should be brought to it, and this name was adopted by the Legislative Assembly, 12th Septem-

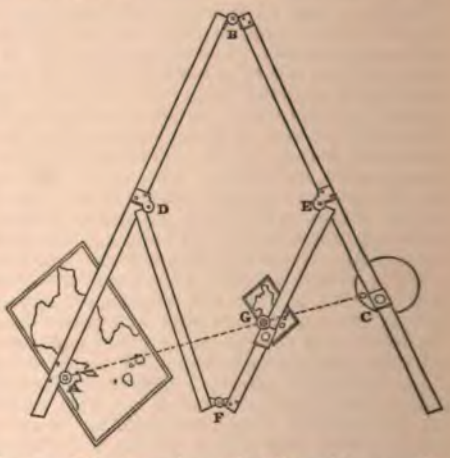
ber, 1792, in ordering the remains of the commandant Beaurepaire, who had committed suicide on the surrender of Verdun, to be carried thither. On 25th November, 1793, the Convention decreed that the remains of Mirabeau should be expelled from the Pantheon, and placed in charge of the commissary of police of the section, while the remains of Marat were installed in their place. The decree was executed 21st September, 1794. Mirabeau's body was interred in the cemetery of Saint-Étienne-du-Mont. The remains of Jean Jacques Rousseau were carried to the Pantheon, 9th October, 1794, by a deputation of the inhabitants of Ermenonville. In 1795, in consequence of a retrospective decree of the assembly, that the remains of no citizen should be interred in the Pantheon until ten years after his death, the body of Marat was removed (8th February) to Saint-Étienne-du-Mont. During all this time the Pantheon was unfinished, and the dome is described as having been very insecure. A visitor in 1795 declared that he expected to be buried under it without a decree. A decree of 6th February, 1806, restored the Pantheon to its title and office as a Christian church, while reserving it as a burial-place for citizens distinguished in arms, letters, or the service of the country. Thirty-nine persons, of whom the most illustrious appears to have been Marshal Lannes, were interred in it during the empire. Louis XVIII. removed the patriotic inscription from the front of the building, and replaced it with a Latin inscription, intimating that the church of St. Geneviève had been built by Louis XV., and restored by Louis XVIII. The remains of Voltaire and Rousseau were placed in a sack (3d January, 1823), carried into the country, and emptied into a pit which had been dug for the purpose. In 1830 the name of Pantheon, and the inscription *aux grandes hommes* were restored. On 27th July, 1831, those who had fallen in the revolution were interred in it. In 1851 Napoleon III. restored the name of St. Geneviève and the Catholic worship. During the siege of Paris, 1870–71, the vault of the Pantheon was used as a magazine for powder and projectiles, immense quantities of which were stored in it; the Prussians in consequence made it a mark for their bombs, and the dome was seriously injured. The interior decoration of the Pantheon, which has occupied the attention of many successive governments, still remains to be accomplished.

PANTHER (*Felis pardalis*), one of the Felidæ or Cat tribe, included in the Carnivorous order of Mammalia. Regarding the zoological nature and position of the panther naturalists have greatly differed. Some zoologists have thus regarded it as the immature form of the Leopard (*F. leopardus*); others as a mere *variety* of the leopard species; whilst a third party has maintained its distinctly specific nature. The Ounce (*F. uncia*) is similarly maintained by some authorities to be the young stage of the leopard. Temminck thus regarded the panther as the chief form, and the leopard as a variety of the panther of Cuvier. Buffon confounds the panther and jaguar of America—a needless and erroneous supposition. The most typical specimens of panthers, or those differing most notably from the leopards, exhibit a length of about 6 feet, the tail measuring an additional 3 feet. The body colour is tawny or bright yellow on the upper parts, paler on the sides, and whitish on the under parts. The back and sides are marked with six or seven rows of round black spots, composed each of four or five smaller spots, disposed or arranged in a circular manner, and possessing in the centre a yellow spot of the general body-colour. Single spots occur on the face, legs, and breast. The ears are short and pointed. The leopard has been generally regarded as possessing ten rows of spots of smaller size than those of the panther. Like the leopard the panther occurs in the more southern portions of the Old World; and this identity in distribution has certainly tended to render the task of distinguishing between these forms more difficult than it would otherwise have been. In disposition the panther is certainly fiercer and more untamable than the leopard. The female carries the young nine weeks. They are born blind, and do not obtain their eyesight for nine days after birth.

Colonel H. Smith says, of the difference between the leopard, and jaguar, and the panther, that the leopard is uniformly 'of a paler yellowish colour, rather smaller, and the dots rose-formed, or consisting of several dots, partially united into a circular figure in some instances, and into a quadrangular, triangular, or other less determinate form in others; there are also several single, isolated, black spots, which more especially occur on the outside of the limbs.' Professor Lichtenstein, of Berlin, says that the jaguar and panther have the 'same number of rows of spots, but the latter is distinguished by having no full spots on the dorsal line.' Mr. Swainson, quoting Smith, remarks, that 'the open spots which mark all the panthers have the inner surface of the annuli or rings more fulvous (in other words, darker) than the general colour of the sides; but in the leopard no such distinction appears, nor is there room, as the small and more congregated dots are too close to admit it.' At Cape Coast and neighbouring localities in Africa the panther is ranked as a sacred animal or fetish.

PANTOGRAPH, also called PANTAGRAPH and PENTAGRAPH (from *pan*, all, and *graphein*, to write or delineate), an instrument consisting of four limbs joined together, and so constructed that by means of it maps and plans may be copied mechanically either on the scale on which they are drawn or on an enlarged or reduced scale. It is made in a variety of forms.

The accompanying cut gives a common form of pantograph. A B, B C, D F, F E are four flat rulers, jointed together with movable joints at the extremi-



ties B F of the two pairs, and at the points D E where the extremities of the two shorter rulers join central points in the two larger ones. The sizes of the shorter rulers, and the positions of the points D and E, are so adjusted that the sections B D and E F, and the sections B E and D F, are respectively equal to one another, so that however the limbs are moved B E F D forms a parallelogram. A G C are movable points,

where tubes running on slides and fastened by means of screws are fixed according to the intention of the drawer. These tubes are intended to receive respectively the pin or shaft of a weight, a pencil, and a tracer. When the points A, G, and C are so adjusted that a straight line can be drawn through them, the triangles A B C and G E C are similar, and from the jointing of the instrument when it is fixed at C every movement of the section A B is repeated by the parallel section G E on a scale in the proportion of the line C A to the line C G. The points C G A are consequently fixed according to the scale on which it is proposed to execute the drawing. The instrument is fixed at C by a circular weight, the pin of which is inserted below into the tube at that point; the pencil is placed in the tube at G, which is loaded above to make it draw steadily, and the paper which is to contain the drawing is to be placed under it; in the tube at A is placed the tracer, with which the lines of the drawing to be copied are followed, and as this is done they are repeated on the reduced scale at G. The instrument is placed on castors at the joints to enable it to move freely. To make an enlarged drawing the position of the tracer and the pencil must be reversed. If the drawing is to be of equal or nearly equal size the fulcrum must be placed in the middle limb.

PANTOMIME. The name pantomimus was given by the Romans to an actor in a dramatic performance consisting of dance and gesture. This sort of representation appears to have been indigenous to Italy. (See MIMES.) The modern pantomime appears also to have originated in Italy, whence, according to D'Israeli, it must have been imported pretty early into England. Some allusions in the Elizabethan drama are explained in the Curiosities of Literature by allusions to its earlier and more Italian forms in this country. The modern Christmas pantomime is a spectacular play of a burlesque character, founded on some popular fable, and interspersed with singing and dancing, followed by a harlequinade, the chief characters in which are the harlequin, pantaloon, columbine, and clown, which may be traced back to the Italian pantomime, although their present development is almost entirely modern. See HARLEQUIN.

PAOLI, PASQUALE DE, a Corsican patriot, born at Morosaglia in Corsica in 1726. He was educated at the Jesuits' College at Naples. In 1755 he was appointed captain-general by his countrymen, who were struggling for their independence against Genoa, his elder brother having declined that post. He organized the government and military resources of the island, and maintained a protracted and generally successful struggle with the Genoese. The latter being unable to subdue the island, first made an agreement with France to garrison the places held by them in it, and finally, in 1768, sold it to France. After a brief struggle Paoli was obliged to yield, and took refuge in England. Here he remained till the Revolution of 1789, when he was recalled by the National Assembly, and made lieutenant-general of Corsica. Disagreements with the Democratic party in France soon led him to throw himself into the arms of England. In 1793 a British army was landed in Corsica, and through his influence the crown was offered to George III., in 1794. Paoli, however, did not obtain the government of the island, and in consequence of differences with Sir George Elliot, who was appointed governor, he withdrew, or was compelled to withdraw to England. He received a pension from the British government. He died in 1807.

PAOLO GIOVIO. See JOVIUS.

PAPA, a town of Hungary, 27 miles north-west of Veszprim, in the county of that name. It has a handsome Greek cathedral with two towers, an old and a large and elegant new castle, a Protestant college, a Roman Catholic gymnasium, and two monasteries; a court-house and infirmary. The principal manufacture is stoneware. Pop. 14,654.

PAPA, the Latin form of *Pope*, the name of the bishop of Rome. It meant originally 'father,' and was applied to bishops generally. It is the name given by the Greek and Armenian churches to all their priests of whatever rank. See POPES.

PAPACY. See POPES.

PAPAL STATES. See CHURCH (STATES OF THE).

PAPANTLA, an ancient town of Mexico, in the state of Vera Cruz, about 120 miles north-east of Mexico. It indicates its ancient splendour by its massive ruins. Among these are a beautiful pyramid, built of beautifully squared and jointed sandstone, and faced with hard stucco, which appears to have been painted. It consists of seven stories, measuring 120 feet at each side of the base, and ascending with gradually diminishing width by a stair of fifty-seven steps, which terminates at the sixth story. The seventh probably contained the altar on which, among other victims, human sacrifices were offered. The trees and plants which have taken root in the joints and stories of the pyramid add much to its singular appearance. Pop. 3000.

PAPAW (*Carica Papaya*, natural order Papayaceæ) is a native of South America. It has very much of the habit of a palm, and attains the height of about 20 feet, having a thick, simple stem, herbaceous in its consistence, and naked till within about 2 feet of the top, and marked with the cicatrices of the fallen leaves throughout the greater part of its length. The leaves have long footstalks, are very large, deeply divided into seven, nine, or eleven lobes, which are sinuate and incised. The male flowers are pure white, agreeably scented, and are disposed in loose clusters, upon long peduncles; the female flowers are very numerous, large, and bell-shaped, composed of six yellow petals, and are supported on short simple peduncles. The fruit is oval, furrowed, about as large as a small melon, full of a sweetish pulp, and contains oblong, wrinkled, and brown or blackish seeds. It is eaten both in a crude state and prepared in various manners, and has an aromatic, sweetish, and tolerably agreeable flavour; but when cultivated in our greenhouses the fruit is entirely worthless. This plant is remarkable for the rapidity of its growth, rising to the height of 6 feet in about six months: it flowers and bears fruit throughout the year. Four other species of *Carica* inhabit the intertropical parts of America. The plant named the papaw in North America is the *Asimina triloba* of botanists, and belongs to the natural order Anonaceæ, or Custard-apple order. It is a shrub or small tree, with an unpleasant odour when bruised; the lurid flowers are solitary in the axils of last year's leaves; petals dull purple; leaves thin, obovate-lanceolate pointed, and 5 or 6 inches long; fruit about 3 inches long, fleshy, and containing several triangular stones, it is insipid, and not much used. It inhabits all parts of the country south of the fortieth parallel of latitude, and even some degrees farther north, on the western side of the Alleghanies. It is rare, however, in the lower parts of the Southern States, and is most abundant in the basin of the Ohio, where it sometimes forms thickets occupying exclusively several acres. Its presence is indicative of extreme fertility in the soil; and in a favourable situation it sometimes attains the height of 30 feet, with a diameter at base of 6 or 8 inches. The wood is extremely soft, spongy, and is applied to no use in the arts. Three other species of *Asimina* inhabit the more southern parts of the United States, and a fourth is

found in Mexico. These, together with the common papaw, constitute a genus exclusively North American.

PAPER. *History.*—Egypt, China, and Japan are the countries in which the earliest manufacture of paper is known to have been carried on. The Egyptian paper was made of the *Cyperus papyrus.* (See PAPYRUS.) According to the information handed down to us, the delicate inner skins were separated from the blade of the grass, and spread upon a table in such a manner that the strips overlapped one another. The table was moistened with water from the Nile, which no doubt had the effect of moistening the natural gum of the plant so as to make the strips adhere. By the ancients an adhesive power was erroneously attributed to the water itself. When this first layer of papyrus skin was complete succeeding layers were laid upon it transversely until the paper was sufficiently thick. The layers were then pressed together, and the sheet of paper was dried in the sun. The Egyptian paper was called *biblos, papyrus, charta Ægyptiaca* or *Niliaca.* Different qualities of paper were distinguished according to the thickness of the skins used in the fabrication. The best quality was called *hieratica,* because it was reserved for religious uses, and not allowed to be exported. The Romans, however, discovered a process of cleansing this kind of paper from the marks of writing, and after this discovery used to import from Egypt sacred books written on this material, which they used for their own purposes after the original writing had been removed. This quality of paper was latterly called by the Romans *Augustus,* while the name of *Lavinia,* the wife of the Emperor Augustus, was given to the second quality, and that of *hieratica* to the third. Inferior qualities were the *amphitheatrica* and *emporetica.* The former, after being manufactured in Egypt, was sometimes submitted to certain processes at Rome by which its quality was improved and rendered equal to that of the best. It is supposed to have derived its name from the fact of its being manufactured in the neighbourhood of the amphitheatre of Alexandria. The latter, as is indicated by its name, signifying 'connected with merchandise,' was used as a shop-paper, and was the coarsest in quality. Besides the papyrus there are remnants of ancient paper made of the inner bark of trees, which, however, does not seem so general, on account of its brittleness. Egyptian paper was in general use in Europe until the eighth or ninth century of our era. It then began slowly to give place to paper manufactured from cotton and other materials, the art of making which was apparently learned by the Arabs in Asia, and introduced by them into Europe. The practice of this manufacture had probably spread to Western Asia from China, where it is known to have existed at a very remote period. Paper was made by the Chinese from some materials at least as early as the beginning of the Christian era; and according to their own account the fabrication of paper from cotton appears to have been invented about 200 A.D. Spain is said to have been the first country in Europe into which the manufacture of paper from cotton was introduced, probably in the eleventh century. In that country, where water-mills were in use, the first paper-mills also were set up, and at a later period carried over (about the year 1300) to Italy, France, and Germany. In these mills the manufacture of paper from cotton rags was commenced. This cotton paper was known under the name of *charta serica, cottonea, gossypina, xylina, damascena,* also *Parcamena Græca.* It differs from linen paper by its less compact texture, and by more easily breaking and blotting. It cannot now be ascertained at what time linen rags were first brought into use for making paper; but to judge from the appearance of some remnants of Spanish paper of the twelfth century, attempts were made as early as that time to add linen rags to the cotton ones, which probably led at a later period to the invention of linen paper. There is a treaty between Alfonso II. of Aragon and Alfonso IX. of Castile, dated 1178, and preserved in the archives of Barcelona, which is written on paper made of linen and hemp. Pure linen paper, however, is not known to have been used till some time after that. The earliest example of its use, evidence of which has come down to us, is in a document of Frederick II., dated 1242, which was found in the monastery of Goss in Upper Styria. It is also the material on which a letter addressed by the historian Joinville (died 1319) to the French king, Louis X., is written. The earliest paper manufactory that is known to have been set up in England is that of John Tate, which was established at Stevenage, in Hertfordshire, in the reign of Henry VII. (about 1495). The next celebated paper manufactory in England is that established by Spilman, a German, at Dartford, in the reign of Queen Elizabeth, from whom he received a monopoly of the manufacture, and of the right of buying linen rags for the purpose. This manufactory of Spilman's is often erroneously stated to have been the first in England. Even after the introduction of the manufacture into this country it long remained in a backward state, so that until late in the eighteenth century this country had to import the finer qualities of paper from France and Holland. The first paper-making company in Scotland was established in 1695.

Materials for Paper-making.—The materials that have been used for the manufacture of paper are very numerous. In China, where much of the paper made is of very excellent quality, far surpassing the best that can be produced by European manufacturers, different materials are used in different provinces. Hemp and linen rags are used in one part of the country, the inner bark of the mulberry in another; and in other parts the skin of the silkworm web, the bark of the elm, rice and straw, trocher or kochu, bamboo, &c. The Japanese make use principally of the bark of the *Morus papyrifera satira,* and the paper manufactured by them is unequalled for strength and softness, which enables it to be used for many purposes for which leather is commonly employed, such as the making of ladies' reticules. The natives of Mexico, before the Spanish conquest, made their paper from the leaves of the agave, in a manner resembling the ancient mode of preparing papyrus. They removed all the fleshy substance from the leaves by putting the plant in water, laid the remaining fibrous textures one on the other, and besmeared them with a clayey substance, which gave to the whole much firmness and elasticity. After the introduction into Europe of cotton and linen rags as materials for paper-making, other vegetable fibres were for many centuries entirely, or almost entirely, given up; not so much, however, on account of their unfitness as because rags, besides being admirably adapted for the purpose, were cheaper than any other material. It was only about the close of the eighteenth century that paper-manufacturers again began to turn their attention to the possibility of using vegetable fibres as substitutes for rags. In 1772 a German of the name of Schöffer or Schäffers had published a work containing sixty specimens of paper made from different vegetable materials; and it was subsequently to this that serious attempts were made to find out some practicable process by which some of them could be used with success to replace rags. The difficulty did not consist in the mere conversion into paper of the materials on which experi-

ments were made, for any vegetable fibre with a rough edge can be made into paper, but in making paper out of them of such quality and at such a price as would enable the manufactured product to compete with that made from rags. Straw, wood, esparto, and alfa are the chief vegetable fibres besides rags that have hitherto been found to answer these conditions, and all of these are now used more or less in paper-making, the last two especially to a very large extent.

Processes of Manufacture.—The combination of flexible fibres by which paper is produced depends on the minute subdivision of the fibres, and their subsequent cohesion. In manufacturing paper from rags, the first process is to sort these materials according to their quality. The rags used are chiefly cotton and linen. Woollen rags are no longer used for the purpose, on account of their increased value for making into shoddy, and for manure. Cotton is used in the manufacture of paper not only in the form of rags, but also in the form of waste or sweepings from spinning-mills, and its application in this form is rapidly acquiring great dimensions in England. The operation of sorting the rags, formerly performed by women in the mills, is now done before the rags are sold to the manufacturer, and with so much accuracy as to require little revision in the manufactory. English rags are divided into fines, seconds, thirds, colours, stamps or prints, rope and bagging, hand stuff, &c.; and foreign rags into similar qualities, distinguished by initial letters well known in the trade. The first mill operation is that of cutting the rags, which was formerly done by the hand at the same time as the sorting, but is now done by machine at the rate of 8 to 10 cwts. per hour. The rags are then put through a machine called a duster, which removes all the dust and sand which may adhere to them. The next operation is that of boiling in a strong alkaline lye of soda and lime, sometimes of lime only, to clean the rags more thoroughly, and, if coloured, to deprive them of their colour. The strength of the solution in which they are boiled varies with the quantity and quality of the colours to be taken out of them. The best machine for this purpose is the spherical rotary rag-boiler, which is stronger than the cylindrical, and has the advantage of letting the rags fall out of themselves when the lid is off. The rags are now conveyed to the rag-engine, subjected to the action of a revolving cylinder, the surface of which is furnished with a number of sharp teeth or cutters, all so placed as to act against other cutters fixed underneath the cylinder. Sometimes two cylinders are fitted up in the same machine, one of which revolves more rapidly than the other, so that the tearing of the rags is more thorough. During this process they are kept immersed in water, and continually exposed to the action of the cutters for a number of hours, till they are minutely divided, and reduced to a thin pulp. This process of pulping seems to have been invented in Holland about the middle of last century. The operation was formerly performed by heating the rags in close vessels till they rotted, or by beating them with stampers, both of which methods of course took up very much more time than the present one. The rags are now transferred to a similar machine, where they are mixed with a quantity of chloride of lime, the effect of which is to bleach them, by discharging the colouring matter with which any part of them may still be dyed or otherwise impregnated. Before the discovery of this mode of bleaching (which dates from 1794) it was necessary to assort the rags, and select only those which were white, to constitute white paper. If, however, the bleaching process be carried too far, it injures the texture of the paper by corroding and weakening the fibres. It is at this stage of the manufacture that toned and other coloured papers have the colouring matter introduced, unless when the colouring matter is confined to the surface of the paper, in which case it is mixed with the size at a subsequent stage of the manufacture. Blue papers are coloured by ultramarine or by oxide of cobalt (called by paper-makers smalts). The pulp, composed of the fibrous particles mixed with water, is now ready to be made into paper. If not wanted immediately it is stored in stuffing-boxes, whence the water is allowed to drain off, leaving a solid mass behind, which, however, can easily be reduced to pulp again by mixing with water and stirring.

Paper is made either by the hand or by machinery. When it is made by the hand the pulp is placed in a stone vat, in which revolves an agitator, which keeps the fibrous particles equally diffused throughout the mass; and the workman is provided with a *mould*, which is a square frame with a fine wire bottom, resembling a sieve, of the size of the intended sheet. These moulds are sometimes made with the wires lying all one way, except a few which are placed at intervals crosswise to bind the others together, and sometimes with the wires crossing each other as in a woven fabric. Paper made with moulds of the former kind is said to be *laid*, and that made with those of the latter kind *wove*. The two kinds can easily be distinguished by the difference of their appearance when they are held up to the light. The so-called water-mark on paper is made by a design woven in wire in the mould. Above the mould the workman places a light frame called a *deckle*, which limits the size of the sheet. He then dips the mould and deckle into the pulp, a portion of which he lifts up horizontally between the two. While he gently shakes the mould from side to side, to distribute the fibres equally and make them cohere more firmly, the water runs outs out through the interstices of the wires, and leaves a coating of fibrous particles, in the form of a sheet upon the bottom of the mould. The sheets thus formed are subjected to pressure, first between felts, and afterwards alone. For the best qualities of paper this operation is repeated several times, the sheets being separated between each pressure to keep them from sticking. They are then *sized* by dipping them in a thin solution of gelatine or glue, obtained from the shreds or parings of animal skins. The use of the size is to increase the strength of the paper, and, by filling its interstices, to prevent the ink from spreading among the fibres by capillary attraction. The sheets are then pressed once more, and after being separated are hung up on lines in a room to dry. The freedom with which they are allowed to contract under this method of drying is probably what gives to hand-made paper its superior firmness and compactness. If the paper is not to be glazed, nothing remains after the drying except to examine the sheets one by one, and make them up into quires and reams. Glazing is done by submitting the sheets to a very high pressure between plates of zinc or copper.

The invention of the machine for paper-making is due to a Frenchman, Louis Robert, a clerk in the firm of M. Leger Didot, and a patent was obtained for it by the inventor from the French government in 1799. It was patented in this country by a Mr. Gamble early in the present century, but was first brought into use here by the Messrs. Fourdrinier, who bought the patent from Gamble. The general principles upon which paper-making machinery operates are not difficult of comprehension. The rags, after having been cut by the machine formerly alluded to, and soaked in water, are in a state of pulp placed in wooden or iron vessels, called stuff-chests, at one end

of the machine, where they are kept constantly agitated by a revolving spindle with arms attached to it. From these the pulp passes to the pulp-regulator, by which the supply of pulp to the machine is kept constant whatever be the amount contained in the stuff-chests. On leaving this part of the machine it first passes through the sand-catchers, made of corrugated iron, where it is freed from sand and dirt, and then through the fine slits in the knotters or strainers, which retain all the lumps or knots which the pulp may contain. It now reaches the part of the machine which corresponds to the mould in the process of making paper by hand, and which consists of an endless web of brass wire-cloth, which constantly moves forward above a series of revolving rollers, while a vibratory motion from side to side is also given to it, which has the same object as shaking the mould in making by the hand. As the pulp passes onwards following the motion of this web the water drains out of it through the interstices of the web. Meanwhile its edges are kept even by what are called deckle or boundary straps, which are made of vulcanized india-rubber. At the end of the wire part of the machine the pulp comes to the *dandy-roll*, which impresses it with any mark that is desired. This roller is placed immediately above two air-boxes, from which the air is partially exhausted, so that the atmospheric pressure comes in to aid in compacting the pulp. The fabric is now received by the felts, also, like the wire part of the machine, an endless web. In passing through this part of the machine it undergoes the pressure of four or five consecutive rollers of 12 to 14 inches in diameter, by which the remaining water is pressed out. After being smoothed by the action of other two rollers the paper, if intended for a printing-paper, or any other kind that requires no special sizing, is dried by passing round a succession of large hot cylinders, the heat of which gradually diminishes from the first to the last. It is then rendered glossy on the surface by passing between cast-iron rollers called calenders, and is finally wound on a reel at the end of the machine, or submitted to the action of the cutters, by which it is cut up into standard sizes. In the case of printing-papers all the sizing that is required can be added while the material is in the state of pulp. For this purpose a blend of rosin and alum or soluble cakes of aluminous size specially manufactured are used. But with writing-papers this method will not do, for it is absolutely indispensable that they should be coated with animal size, such as is used for hand-made paper; and if such size were mixed with the pulp it would clog the felts, and seriously impede the working of the machine. Such papers are accordingly sized after being made. After leaving the machine the web of paper which is to be sized is passed through the sizing-tub, and is then led round a series of large skeleton drums (sometimes as many as forty) with revolving fans in the inside, by the action of which the paper is dried. If the paper were dried by hot cylinders after the sizing, there would be a loss of strength in consequence of the drying being too rapid. After being dried the paper is glazed by the glazing-rollers, and then cut up. Some manufacturers cut machine-made paper into sheets before the sizing, and then after they are sized hang them up to dry on lines, as is done with hand-made paper, by which means the paper acquires much of the hardness and strength possessed by that made by the hand. It would be totally inconsistent with the plan of this work to enter into minute detail in describing the machinery employed in paper manufacture, and numerous plans, elevations, and sections would be necessary to make the action of all the parts intelligible even to a practical mechanic. The account we have given will be understood by the general reader, and those who wish for minute details must have recourse to the accounts given of the various patents that have been taken out by the original inventors, and those who have followed them in the way of improvement. The total length of a paper-machine, with the sizing apparatus attached, from the beginning of the wire-cloth to the cutters, is sometimes no less than 1000 feet.

The first to devise a practicable method of treating straw so as to make it capable of being manufactured into paper was Koops, at the beginning of the present century. Various improvements have since been effected in his process, and there are now some mills which turn out nothing else than paper made from straw; but the chief and best use of straw in paper-making is to impart stiffness to common newspaper. In the preliminary treatment of straw the essential thing is to destroy the silica it contains by means of a strong alkali. If this were not done the paper would be too brittle for use.

Two processes have been patented for the manufacture of paper entirely from wood. By the first process the wood is boiled in caustic soda lye to remove the resinous matter and then washed to remove the alkali. It is afterwards treated with chlorine gas or an oxygenous compound of chlorine, then washed, and finally reduced to pulp by the addition of a small quantity of caustic soda. By the other process the pulp is obtained by merely grinding down the wood and mixing with water during the operation. It is obvious that this process can be used only for the coarser kinds of paper.

Esparto or Spanish grass (*Macrochloa tenacissima*), exported largely from Spain, Algeria, Tripoli, Tunis, and other countries, has been applied to paper-making only in comparatively recent years. But so suitable has this material been found that the enormously increased production of British paper-makers has been chiefly due to its use. The lye in which esparto is prepared contains more lime than is necessary to make the alkali caustic. Besides being steeped in this lye the material is boiled in a solution of carbonate or bicarbonate of soda, which neutralizes the resinous and destroys the silicious matter. The engine used to tear the rags into shreds is replaced in making from esparto by a machine called a *devil* for disintegrating the fibres of the material. In 1864 the imports of esparto and other vegetable fibres for paper-making (exclusive of rags) into the United Kingdom amounted to 43,931 tons; in 1882 they had risen to 180,849 tons.

The use of rushes for paper-making belongs to America, and dates from the year 1866. The paper made from this material is said to be white, firm, and of good quality, and twenty per cent. cheaper than that made from wood.

The root of the lucern (*Medicago sativa*) has also been applied with success in France of late years to the fabrication of paper.

Mineral substances, on account of their cheapness, are sometimes added to the fibrous materials necessary to make paper. Those most generally used are a silicate of alumina called Lenzinite, which is a fine, soft, white clay; kaolin or porcelain earth, which resembles Lenzinite in its composition; and artificial sulphate of barium, or, as it is called, permanent white. The first two substances have a tendency to diminish the tenacity of the fabric, but have no very noxious effect unless more than 15 per cent. is added to the fibrous pulp. The last is thought by some manufacturers to be positively beneficial to printing-papers, enabling them to take a clearer impression from the ink.

Standard Sizes.—Paper, as it proceeded from the mill, was formerly cut with rigorous exactness into certain

standard sizes, distinguished by different names. The correctness of the dimensions was insisted on by the government as long as the duty on paper (abolished in 1860) was payable according to the size, but when the duty was made payable according to the weight some manufacturers began to depart in some measure from the dimensions formerly fixed. The following table, taken from Ure's Dictionary of Arts, Manufactures, and Mines, gives the names and proper dimensions of the principal sizes of fine (writing, printing, and drawing) and coarse papers. The curious names that many of them bear are generally derived from the old water-marks by which they were originally distinguished. Many of the sizes given in the table are to be had in all varieties of colour, thickness, and quality, so that a first-class stationer's shop will sometimes contain 2000 different sorts of paper.

Fine Papers.

Pot,	12½	by 15	inches.
Foolscap,	16½	by 13½	,,
Post,	18¾	by 15½	,,
Copy,	20	by 16½	,,
Large post,	20¾	by 16½	,,
Medium post,	18	by 22½	,,
Sheet and third foolscap,	22½	by 13½	,,
Sheet and half foolscap,	24½	by 13½	,,
Double foolscap,	27	by 17	,,
Double pot,	15	by 25	,,
Double post,	30½	by 19	,,
Double crown,	20	by 30	,,
Demy,	20	by 15½	,,
Demy printing,	22½	by 17½	,,
Medium,	22	by 17½	,,
Medium printing,	23	by 18½	,,
Royal,	24	by 19	,,
Royal printing,	25	by 20	,,
Super-royal,	27	by 19	,,
Super-royal printing,	21	by 27	,,
Imperial,	30	by 22	,,
Elephant,	28	by 23	,,
Atlas,	34	by 26	,,
Columbier,	34½	by 23½	,,
Double Elephant,	26¼	by 40	,,
Antiquarian,	53	by 31	,,

Coarse Papers.

Kent cap,	21	by 18	inches.
Bag cap,	19½	by 24	,,
Havon cap,	21	by 26	,,
Imperial cap,	22½	by 29	,,
Double 2-lb.,	17	by 24	,,
Double 4-lb.,	21	by 31	,,
Double 6-lb.,	19	by 28	,,
Middle hand,	21	by 16	,,
Lumber hand,	19½	by 22½	,,
Royal hand,	20	by 25	,,
Double small hand,	19	by 29	,,
Copy loaf,	16¾	by 21¾	,,
Powder loaf,	18	by 26	,,
Double loaf,	16½	by 23	,,
Single loaf,	21½	by 27	,,
Lump,	23	by 33	,,
Titler,	29	by 35	,,
Prussian or Double lump,	32	by 42	,,

It must be remembered that the dimensions here given are those of the papers as they leave the hands of the manufacturer, and are reduced by the stationer, who ploughs and finishes off the edges. Many newspapers now print from the reel, the paper not being cut till after it is printed. The reels so used are sometimes several miles in length.

Special Varieties of Paper.—Blotting and filtering paper are both made in the same way as ordinary paper except that the sizing is omitted.

Copying paper is made by smearing writing paper with a composition of lard and black-lead, which, after being left alone for a day or so, is scraped smooth and wiped with a soft cloth. When a sheet of this kind of paper is interposed between two sheets of writing paper, anything written with a lead-pencil on the upper sheet will be found also on the lower one.

Incombustible paper has been made from asbestos. A Dr. Brückmann published at Brunswick in 1727 a memoir on the subject of making paper in this way, and four copies of the memoir were printed on paper of the kind described. The invention is curious, but of no practical utility, since fire removes the ink from a book printed on this material even though it does not destroy the paper itself.

Indelible cheque paper has been patented on several occasions. One of the latest patentees is Mr. Robert Barclay, and according to the process invented by him the paper is treated with an insoluble ferrocyanide and an insoluble salt of manganese, and is sized with acetate of alumina instead of alum. The use of alum would have the effect of discolouring the paper. Any marks made by writing ink on this paper are said to be unalterable by any chemical process yet known, and become only the clearer by exposure to damp, sea-air, or water.

Lithographic paper. See LITHOGRAPHY—Transfer Paper.

Parchment paper or vegetable parchment is made from ordinary unsized paper by dipping it for a few seconds in a liquid consisting of one part of water and two parts of sulphuric acid or oil of vitriol at the temperature of 60° Fahr., then washing it in cold water, afterwards dipping it in a weak solution of ammonia to remove the last traces of the acid, and finally washing it once more in water and drying. While drying it must be kept under pressure or stretched on a frame, otherwise it is liable to curl up. This material is, like parchment, tough, translucent, highly polished on the surface, and almost impermeable to water, the action of which even when boiling it will resist for many hours, only losing its tenacity after a long period of immersion.

Pasteboard is made from coarse paper by pasting several sheets together or by laying the sheets above one another when fresh from the mould and uniting them by pressure. This second method is much the better of the two, as the sheets cohere more firmly. Of course it can only be adopted with hand-made paper. Pasteboard made in the other way is very apt to split into separate sheets when subjected to unusual heat. Another way of making pasteboard is to macerate paper and cast it in moulds.

The so-called rice paper of confectioners is not an artificial paper, but a vegetable membrane imported from China, and obtained apparently from the pith of a plant called *Aralia papyrifera*.

Tissue paper is a very thin paper of a silky softness used to protect engravings in books and for various other purposes. It is called in French *Papier joseph* from its inventor Joseph Montgolfier.

Tracing paper is made from tissue paper by soaking it with Canada balsam and oil of turpentine or nut-oil and turpentine. It permits the outlines of a drawing placed beneath it to be seen through so that a draughtsman can make a fac-simile of the drawing upon it.

New Applications of Paper.—Nothing is more remarkable than the great number and diversity of new uses that have been found for paper in recent years. Besides being largely employed for making collars, cuffs, and other articles of dress, it is sometimes used for making huts in the backwoods of America, and the huts made of it are found to be warmer than those made of wood or sheet-iron; also for making boats, pipes, and tanks for water, which is then less liable to freeze than when lead is used; cuirasses to resist musket-bullets, wheels for railway-carriages, and even bells and cannons. Paper wheels have been used for some of Pullmann's railway saloon cars in America, and have worn out one set of tyres. Cannons made of paper have actually been tried with success.

Production of Paper in Various Countries.—Eng-

land, America, Germany, and France take the lead in this branch of industry. The first to make any considerable improvements in the state of this manufacture in England was James Whatman, who set up a paper-mill at Dartford in Kent in 1760; and since his day numberless improvements have been made which have brought British-made paper to a point of excellence which is unsurpassed if indeed it is equalled by the products of any other country of Europe or by those of America. Kent has always been the chief seat of this manufacture in England. The first paper-mill in America appears to have been erected in 1714 on Chester Creek in Delaware. In Germany the chief paper-producing state is Baden, but other states are now rapidly multiplying the number of their machines. The principal manufactories of France are those of Angoulême, Rives d'Annonay (rendered celebrated by the Montgolfiers), Sainte-Marie, and Essonnes. In Italy considerable quantities of paper are manufactured, especially in Piedmont, Venetia, Tuscany, and Naples. Austria, Russia, and Belgium also produce largely. The Belgian paper is the cheapest in Europe, being of bad quality owing to the large percentage of kaolin in it.

The following table shows the amount of paper manufactured and consumed per head in the principal countries of Europe and in the United States:—

	Manufactured. lbs.	Consumed. lbs.		Manufactured. lbs.	Consumed. lbs.
Great Britain,	13·2	12·1	Denmark,	4·4	4·4
Germany,	9·9	8·8	Italy,	4·4	4·4
Belgium,	9·9	7·7	Austria,	4·4	4
France,	8·8	7·7	Portugal,	3·3	4
Switzerland,	8·8	7·7	Russia,	1·1	1·1
Netherlands,	6·6	6·6	Spain,	1·1	1·1
Norway and Sweden,	5	4	United States,	12·1	11

PAPER-HANGINGS, ornamental papers often pasted on the walls of the rooms in dwelling-houses. The staining of papers for this purpose is said to be a Chinese invention, and was introduced into France at the beginning of the seventeenth century. It is now common everywhere, but more especially in France, England, and the United States. The amount of the production in England fully equals, and even exceeds that of France; but in respect of quality the finer French paper-hangings surpass those of all other parts of the world. Most of the processes in paper-staining are now usually done by machinery; but there is still much hand-work in the finer qualities, especially those produced in France. The first operation is that of grounding, which consists in covering the surface with some dull colour, the tint of which varies. Even hangings with a white ground are subjected to this operation. The colouring matter used for the purpose is generally diluted in weak glue. The following is the method by which it is done. A roll of paper several hundred yards in length is placed at one end of a horizontal table. Being unwound by machinery it slowly advances over the table, before reaching which, however, it receives the colouring matter, either by coming in contact with an endless web of cloth, which, revolving about two rollers, passes through a trough of the liquid, or by passing under a box from a longitudinal slit in the bottom of which the colouring matter flows out. On reaching the table it is submitted to the action of flat brushes, which move backwards and forwards across the breadth of the paper, and distribute the colour uniformly. The paper is then slowly dried in a large room, in which it is allowed to hang freely in numerous long folds, and is then again wound up into a roll. For high-priced papers several coats of the ground colour are required. Papers with a glazed ground are usually glazed immediately after receiving the ground tint. The paper in being unwound from the roll in which it is made up after the completion of the grounding process is slightly moistened by coming in contact with an endless web of wet cloth, and afterwards passes under an angular sieve with several sides. This sieve contains powdered soap-stone or steatite, and revolves on a horizontal axle. As often as one of its faces is parallel to the paper beneath it drops a certain quantity of the powdered soap-stone, which adheres to the moist surface of the paper. The soap-stone is rubbed in by horizontal revolving brushes, the action of which produces the desired gloss. Sometimes polish and lustre are given to paper-hangings by rubbing their surface with a hard stone, flint or agate. This is done in the case of marbled papers when the last stage of the manufacture has been reached. Lastly, some kinds of paper-hangings are varnished. The designs on the surface of paper-hangings are applied by hand processes and machines exactly similar to those employed in calico-printing, and it is therefore needless to repeat the description of them here. (See CALICO-PRINTING.) We will only describe one apparatus which is used for making the lines on striped papers. In this apparatus the colouring matter is put into a triangular box, which rests upon one of its edges at one end of a long table, and which is divided into compartments which may be filled with different colours if necessary. In the lower edge of this box there are as many holes as there are to be stripes in the paper, which, being passed between the box and the table, receives the colour as it advances. *Flock-paper* is made by printing on the parts which are to receive the flock a mordant, called by the workmen *encaustic*, composed of strong oil boiled with litharge and white-lead, to render it drying. Before the encaustic is dry the paper is passed through a chest containing the flock, which is finely comminuted wool obtained from the shearing of cloth, and afterwards scoured, dyed, ground, and sifted. The bottom of this chest is of linen or calf-skin, and is struck with rods so as to raise this fine wool dust in a cloud, which falls on the paper, and adheres to the parts to which the encaustic has been applied. There are two processes employed in *gilding* and *silvering* paper-hangings. In both cases a mordant is used similar to that used for flock-papers. The first process consists in covering the whole surface of the paper with very thin sheets of brass (or silver), which are made to adhere by the pressure of a roller. After the mordant has been allowed to dry the surface is rubbed with bread-crumb, when the metal remains attached only to the mordanted parts, the rest coming off in the form of powder. Sometimes gold-leaf is applied to the mordanted parts, and the superfluous parts brushed off with a dossil of cotton wool or linen. The second process exactly resembles that used in making flock-paper, except that a metallic powder is substituted for the finely comminuted wool used in the other case. When the paper-hangings have been gilt it is necessary to give lustre to the metallic parts. This is done by passing the sheet of paper between two rollers, one of cast-iron highly polished, the other of paper. The gilt side of the paper is next the metal roller, the pressure of which produces the desired lustre.

PAPER MONEY. See CURRENCY.

PAPER-NAUTILUS, or ARGONAUT, one of the Dibranchiate or 'two-gilled' Cephalopoda or Cuttle-fishes, included in the family Argonautidæ, and distinguished by the possession (by the females only) of a single-chambered external shell. The arms are eight in number (Octopoda), and are provided with sessile suckers. The body is of short conformation, and destitute of side or lateral fins. Two of the *arms*

are developed to form membranous expansions, which not only secrete, but are ordinarily folded round the shell, so as to protect and cover it. The shell of the argonaut, not being secreted by the mantle or pallium (see MOLLUSCA), is not a true shell, or homologous with the shells of other Molluscs. It is not organically connected to the body of the animal, but is kept in apposition to the body chiefly by the webbed dorsal arms. The shell serves chiefly as a receptacle for the ova or eggs of the female; and the body of the argonaut is so placed in the shell that the 'funnel' or respiratory tube (see CEPHALOPODA and MOLLUSCA) is turned towards the 'keel' or 'carina' of the shell. The third left arm of the male argonaut is developed to form a 'hectocotylus,' or organ through which the reproductive functions of the male are discharged. This arm is detached from the male, and is deposited within the mantle or pallial cavity of the female, so as to impregnate the ova. The hectocotylus is primarily developed in a cyst, from which it is afterwards liberated. The male argonaut is of much smaller size than the female, and averages about an inch in length. The male possesses no shell.

The paper-nautilus is to be carefully distinguished from the Pearly Nautilus described in the article NAUTILUS, which latter is a four-gilled or Tetrabranchiate Cuttle-fish, and presents an entirely different structure from the argonaut. The paper-nautilus is the form so much celebrated in poetry, as the animal which is supposed to sport itself buoyantly on the surface of the waves, using its shell as a literal boat, and its expanded arms as veritable sails. Byron thus talks of the argonaut, as

> 'The tender nautilus who steers his prow,
> The sea-born sailor of his shell canoe,
> The ocean Mab, the fairy of the sea.'

Pope says:—

> 'Learn of the little nautilus to sail,
> Spread the thin oar, and catch the driving gale.'

Montgomery has also described the paper-nautilus in his Pelican Island, as 'the native pilot' of his 'little bark,' who puts 'out a tier of oars on either side,' and so progresses, mounting up and 'gliding down the billow.' It is needless to remark that these poetic descriptions are purely fanciful, and that the argonaut has no power of so comporting itself on the surface of the sea, or of using its expanded arms as sails, or its ordinary arms as oars. Like other cuttle-fishes it can propel itself backwards along the surface of the water, or through the depths of the sea, by means of the *jet d'eau* from the funnel; or it may crawl head-downwards over the bottom, by means of its sucker-furnished arms. But in no case are the arms detached from the fragile shell to be used as sails, and zoological science has thus to dispel the otherwise beautiful and poetic simile. Various species of argonaut are known. The familiar species is the *Argonauta argo* of the Mediterranean Sea. *A. papyracea* is another kind; whilst *A. Owenii* of the Indian Ocean, and *A. hyans* of the Pacific Ocean are also known to naturalists. (See Pl. CXXVIII.–CXXIX. fig. 25.)

PAPHLAGONIA, a district in the north of Asia Minor, between Bithynia on the west and Pontus on the east. Its boundaries were not well fixed; but it was usually represented by ancient writers as having been separated from the former district by the river Parthenius, and from the latter by the Halys, and to have been bounded on the south by the chain of Olympus, or that of Olgassys, separating it in early times from Phrygia, and later from Galatia. It was a mountainous country, covered, except a fertile margin on the coast, with native forests, which were celebrated as hunting-grounds. It was famous for its horses and mules. On the coast there were two Greek cities, Amastris and Sinope, which carried on a considerable commerce. The inhabitants were a Semitic or Syro-Arabian race. The Paphlagonians were first subdued by Crœsus, king of Lydia, and afterwards formed part of the Persian Empire, until their satraps made themselves independent, and assumed the title of kings. After the death of Alexander the Great Eumenes acquired the government of Paphlagonia, along with Cappadocia and Pontus (323 B.C.); but after his death (316 B.C.) the native princes again made themselves independent, and continued so till the country was subdued by Mithridates (63 B.C.), on whose overthrow the district was incorporated with the Roman Empire, the maritime strip immediately, and the interior at a later period.

PAPHOS. There were two cities of this name in the Island of Cyprus—Old Paphos, a little more than a mile distant from the south-western coast, upon a height; and New Paphos, 7 or 8 miles to the north-west of Old Paphos, situated on the sea-shore. The first was famous in antiquity for the worship of Aphroditē (Venus), thence called *Paphia* or *Cypria*. It was said that Aphroditē here first landed when she arose out of the sea. Here was an old image of the goddess, not made to represent the human form, but a white twisted stone terminating in a point; also the oldest temple in the island, which contained large treasures, and in which bloodless offerings were presented to the goddess, such as incense and garlands of flowers. This image, together with an old tradition, seems to prove that the early worship of the goddess in this place was accommodated to the Phœnician and Syrian religious rites. Old Paphos was indeed probably of Phœnician origin, and Astarte, identified by the Greeks with Aphrodite, was the goddess really worshipped. Under the Romans New Paphos was the capital of one of the four districts into which Cyprus was divided, and it was here that Paul preached before the Proconsul Sergius. The town now standing on the site of New Paphos still bears a name corrupted from the ancient one, Baffa.

PAPIAS, a Christian writer of the age succeeding that of the apostles. He is described by Irenæus as a 'hearer of John and a companion of Polycarp,' an account repeated by various subsequent writers. It has been disputed whether the John mentioned by Irenæus was the apostle John or John the Elder, an eminent member of the early Christian church at Ephesus. The decision of this question is of the less importance, inasmuch as the statement of Irenæus appears to be inaccurate as to his being a hearer of John, for a passage of his own works (quoted by Eusebius) is inconsistent with the supposition of his having been personally acquainted with either of the Johns referred to. Papias is stated by the Alexandrian Chronicle to have been martyred at Pergamus in 163 A.D., and some suppose him to have been Bishop of Pergamus, but this is mere conjecture. He was a believer in the personal reign of Christ on earth for a thousand years after the resurrection of the dead. He was the author of five books of commentaries on the Sayings of our Lord (Logōn Kuriakōn Exēgēsis), which, however, are all lost, except a few valuable fragments, which give important information as to the early traditions regarding the writings of the New Testament. It is from them that we learn that Matthew's Gospel was traditionally believed to have been written in Hebrew, and the evangelist Mark to have been the interpreter (*hermeneutēs*) of Peter, and wrote to his dictation.

PAPIER MÂCHÉ is a substance made of cuttings of white or brown paper boiled in water, and beaten in a mortar till they are reduced into a kind of paste, and then boiled with a solution of gum Arabic or of size to give tenacity to the paste. Sulphate of iron,

quicklime, and glue, or white of egg are sometimes added to enable the material to resist the action of water, and borax and phosphate of soda to render it to a great extent fire-proof. It is used for making all sorts of useful and ornamental articles that can be formed in moulds. When dry the objects are usually covered with a mixture of size and lamp-black, and often ornamented with coloured designs, or inlaid with mother-of-pearl, and lastly they receive a coat of varnish. Sometimes the papier mâché is made by pasting or gluing sheets of paper together, and pressing them when soft into the form which it is desired to give them.

PAPILIO, a genus of butterflies (Lepidoptera), including several very brilliantly coloured and beautiful forms. The caterpillars of this genus, which forms the type of the family *Papilionidæ*, are distinguishing by possessing a forked process borne on the back of the neck, capable of being retracted, and which is supposed to be used for the purpose of protecting the larvæ from the attack of insects. The pupæ are popularly known as *chrysalides*, the cocoons being angular, and occasionally furnished with spines. The Swallow-tailed Butterfly (*Papilio machaon*), the Peacock Butterfly (*P. Io*), &c., represent this genus.

PAPILIONACEÆ, in botany, a division of plants, sometimes treated as a sub-order of the Leguminosæ, and sometimes as a separate order. Their distinguishing characteristic is their papilionaceous flowers, so called because, when the corolla is full blown, the superior petal resembles the extended wings of a butterfly (Latin, *papilio*). The best known examples of this very common form of corolla are the blossoms of the pea and bean, which are the typical plants of this division. The papilionaceous corolla consists of five petals. The superior petal, which usually folds over the inferior ones in æstivation, is called the *vexillum* or *standard*, the two lateral ones are called the *alæ* or *wings*, and the two inferior ones, which are often united slightly by their lower margins, so that their union resembles the keel of a ship, are called the *carina* or *keel*. These last two petals are usually wholly or partially enfolded by the *alæ*, and themselves enfold the reproductive organs. The Papilionaceæ form a very extensive botanical division, and are subdivided into six tribes or sub-orders, namely, the Podalyrieæ, Loteæ, Hedysareæ, Phaseoleæ, Dalbergieæ, Sophoreæ.

PAPILLA, the name applied in physiology and anatomical science to small or minute processes protruding from the surface of the skin, or of membranes generally, and which may possess either a secretory or other function. Thus on the dermis, or true skin of birds, dermal papillæ exist, by each of which a feather is formed. Hairs are similarly formed upon small papillæ, or prominences of the dermis. Teeth are produced by a similar structure of the dermis. In the human skin the surface of the dermis or corium is elevated into numerous papillæ, with divided or single extremities, and through which the sense of touch is chiefly exercised. The papillæ of the tongue are highly important structures in connection with the exercise of the sense of taste. See SKIN and TONGUE.

PAPIN, DENYS, an eminent natural philosopher, was a native of Blois, in France, and was born on the 22d of August, 1647. After finishing his studies he made a visit to England, and in 1681 was admitted a Fellow of the Royal Society. Being a Protestant the revocation of the Edict of Nantes prevented him from returning to his native country, and on leaving England he settled at Marburg, in Germany, in 1687, as professor of mathematics. He retained this charge till 1707. From this date the events of his life are not well known, but he is believed to have died in Germany about 1714. Papin chiefly distinguished himself by his researches concerning the power of steam, and the influence of mechanical pressure in retarding the ebullition of liquids. He suggested the principle which led to the invention of the steam-engine (see NEWCOMEN); but he is best known for an invention of his own, denominated *Papin's Digester* (see DIGESTER), to soften bones, &c.

PAPINIANUS, ÆMILIUS, the greatest Roman lawyer of his time, born under Antoninus Pius, about 140, according to some at Beneventum, in Italy, according to others in Syria. He applied himself to the study of Greek and Roman literature, philosophy, and jurisprudence, and by his solid learning and inflexible integrity obtained great credit and influence, was honoured with the first offices of state, and at last was chosen prefect of the prætorian guards under the Emperor Septimius Severus, whom he accompanied to Britain. Severus on his death-bed, in 211, is said to have recommended to his care his two sons, Caracalla and Geta. Papinian tried all means of preserving concord between them, but his remonstrances were so disagreeable to Caracalla that he at last removed him from his place, though he still continued to treat him outwardly as a friend and confidant. When Caracalla had caused his brother to be assassinated, he asked Papinian to justify the deed; but received for answer, that it was easier to commit fratricide than to justify it, and that it would be a second murder to sully the memory of an innocent man. Caracalla concealed his anger; but when the prætorian guards, probably at the instigation of the tyrant, demanded the head of Papinian, he gave him up to their fury, and caused him to be executed in the year 212. His reputation as a lawyer was so high, that Valentinian III. ordered that whenever the opinions of the judges were divided Papinian's opinion should be followed. There are 595 excerpts taken from his works (which include thirty-seven books of Quæstiones, nineteen books of Responsa, two books of Definitiones, two books De Adulteriis, a single book De Adulteriis, and a Greek work or fragment) in the pandects, or digest of the Roman law compiled under Justinian.

PAPPENHEIM, a town in Bavaria, in Middle Franconia, 33 miles south-east of Anspach, on the Altmühl, with a church, a synagogue, a Latin school, and a handsome castle of the counts of Pappenheim. Among the manufactures are fine pottery, meerschaum pipes, and cutlery. Solenhofen, which has the finest quarry of lithographic stones yet discovered, is about a mile distant. Pop. 1731.

PAPPENHEIM, GOTTFRIED HEINRICH, COUNT OF, imperial general in the Thirty Years' war, was born in 1594, at Pappenheim, in Franconia, and was descended from an ancient and noble German family. He distinguished himself in the battle of Prague as colonel, in 1620. Having been in 1623 appointed by the emperor commander of a regiment of cuirassiers, which from him took the name of the Pappenheimer dragoons, he served from 1623–25 in Lombardy. In 1626 he conquered, with the assistance of the Bavarians, 40,000 peasants in Upper Austria, who had taken arms to defend their faith; then traversed Northern Germany, and joined in 1630 General Tilly, whom he even outdid in cruelty, on the taking of Magdeburg. His fiery courage distinguished him everywhere; but he was not qualified for a commander-in-chief. Tilly ascribed the loss of the battle of Leipzig in 1631 to his impetuosity. He appeared on the field of Lützen on the side of Wallenstein, was mortally wounded, and exclaimed, when he heard that Gustavus had also fallen, 'Let the Duke of Friedland (Wallenstein) know that I am mortally wounded; but I depart with joy, as I know that the

implacable enemy of my faith has fallen with me on the same day.' He died the day after the battle, November 7, 1632.

PAPPUS, ALEXANDRINUS, an eminent mathematician, who flourished at Alexandria towards the end of the fourth century. The accounts of his life are extremely scanty, and all his works appear to have perished, except his Mathematical Collections, which possesses great value, and has sufficed to found his fame. It originally consisted of eight books, of which the whole of the first and about a half of the second are lost, and some of the others are much mutilated. The contents are somewhat miscellaneous, containing, in addition to geometrical problems and theorems, a treatise on mechanics and many interesting notices as to the state of mathematical knowledge at the time. The original Greek has never been printed complete, but there are Latin translations by Commandine (Pesaro, 1588), and by Manolessius (Bologna, 1660).

PAPPUS, PROPERTIES OF. See Supplement.

PAPUA. See NEW GUINEA.

PAPYROGRAPH. See COPYING MACHINES.

PAPYRUS (*Papyrus antiquorum*, the *Cyperus papyrus* of Linnæus), a plant belonging to the natural order Cyperaceæ. This sedge-like plant has acquired celebrity from its furnishing the paper of the ancient Egyptians. The root is very large, hard, and creeping; the stem is very stout, naked, except at the base, 8 to 15 or more feet high, triangular above, and terminated by a compound, wide-spreading, and beautiful umbel, which is surrounded with an involucre composed of eight large sword-shaped leaves. The inconspicuous flowers are disposed in little scaly spikelets, which are placed at the extremity of the rays of this umbel. It is an aquatic plant, and the lower part of the stem is always immersed in water. Formerly it was extensively cultivated in Lower Egypt, but is now rare there. Bruce observed it in the Jordan, and in two places in Upper and Lower Egypt. It is abundant in the equatorial regions of Africa in many places, often forming so dense jungles as to impede navigation; it is found also in Western Africa, and is met with growing wild in Sicily, on the banks of the Anapus, near Syracuse. The uses of the papyrus were by no means confined to the making of paper. The inhabitants of the countries where it grows, even to this day, manufacture it into sailcloth, cordage, and sometimes wearing apparel. Boats are made by weaving the stems compactly together, and covering them externally with a resinous substance to prevent the admission of water. Although these resemble baskets in their appearance, they are of great utility, and are extremely common in Abyssinia. The roots are also employed for fuel. The most noteworthy use, however, was for the manufacture of paper, by a process which had been known in Egypt from the remotest antiquity, even before the historical times of Greece. In greenhouses the plant must be grown in water having rich mud at the bottom. (Pl. XC.–XCI.)

PAR (Latin, *equal*) is used to denote a state of equality or equal value. Bills of exchange, stocks, &c., are *at par* when they sell for their nominal value; *above par* or *below par* when they sell for more or less.

PARA, a Turkish and Egyptian coin, very thin and small, of copper or copper and silver, the fortieth part of a Turkish piastre (grush), which is constantly varying in value. The value of the para is from $\frac{1}{15}$ to $\frac{1}{18}$ of an English penny.

PARÁ, or GRÃO PARÁ, a maritime province of Brazil, of great size but thinly populated, lying about the lower part of the Amazon, and including Brazilian Guiana, on the north side of that river. It is bounded on the north by British, Dutch, and French Guiana; east by the provinces of Maranhão and Goyaz; south by that of Matto Grosso; and west by Alto Amazonas; area, 443,790 square miles. On the northern frontiers are several mountain ranges of considerable height, but the great features by which the province is characterized are its immense plains and the mighty rivers which flow through them. In the eastern part of the province the Tocantins and a number of minor streams carry their waters directly to the ocean, but with this exception all the other rivers are tributaries of the Amazon. The principal of these tributaries are the Negro on the left, the Madeira, Tapajoz, and Xingu on the right bank. The spaces which separate the tributaries from the main stream and from each other are either occupied by tracts of pathless and almost interminable forests, or stretch out into alluvial plains, often clothed with the richest verdure, and almost always of inexhaustible fertility. The climate is remarkably equable, the temperature varying only between about 87° and 100° Fahr. The richness of the soil, seconded by the heat of a tropical sun, produces vegetable forms of gigantic magnitude, from which timber of almost unequalled excellence, both for ordinary and ornamental purposes, is obtained; while even the spontaneous undergrowth furnishes endless varieties of plants and shrubs of the greatest value both in medicine and in the arts. In the comparatively limited tracts which have been brought under cultivation the most important crops are mandioc, rice, millet, coffee, cotton, and sugar-cane. Silkworms are reared; they are fed on the leaves of the orange-tree, and yield a silk of a dark yellow colour. In respect of minerals the province, so far as has yet been ascertained, is comparatively poor. Gold and silver, as well as emeralds and other precious stones, occur, but only to a very limited extent. The principal exports are rice, urucu or annotto, a dye said to be preferable to Brazilian wood; cacao, sarsaparilla, caoutchouc and other elastic gums; balsam copaiba, pimento, rum, timber, &c. Population in 1882, exclusive of Indians, 329,511. The Indian population is estimated at about 30,000.

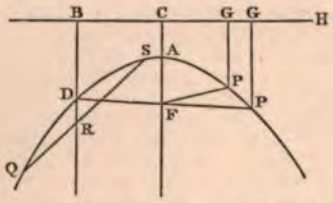
PARA, or BELEM, a city and seaport in Brazil, capital of the province of Pará, on the right bank of the estuary of Rio Pará, where it is entered by the Guama. Pará has straight and mostly paved streets; its houses are of stone, constructed with solidity and some pretensions to elegance. The principal buildings are the governor's palace and the cathedral, magnificent edifices; but besides these the cruciform church of Santa Anna, and the octagonal one of São João Baptista are noteworthy. The city possesses several other churches, a convent turned into a barrack, an arsenal, an Episcopal palace, a seminary in which Latin, theology, &c., are taught; a college with chairs of Latin, rhetoric, philosophy, geometry, and French; a normal and two primary schools, two convents, one of Carmelites and another of Capuchins; three hospitals, and a botanic garden rich in plants both exotic and indigenous. Pará is the seat of the legislative assembly of the province, the residence of the president, of the commander of the forces, and of the Bishop of Pará. The port is defended by forts, and is capable of admitting vessels of any size; the tide rises 10 or 12 feet. The trade of the port is rapidly rising. The principal exports are caoutchouc, cacao, Brazil-nuts, salt, copaiba, rice, piassava, sarsaparilla, annotto, and cotton. The principal disease is intermittent fever. Pop. estimated at from 30,000 to 35,000.

PARABLE, a short tale in which the actions or events of common life are made to serve as a vehicle for moral lessons. The word is derived from the Greek *parabolē*, which literally signifies 'a throwing

beside,' and hence a comparison or illustration. In classical Greek this word *parabolē* is not used in any sense resembling that of our word parable; but by the Hellenistic writers it is used almost invariably as the equivalent of the Hebrew *mâshâl*, which, properly meaning similitude, was applied alike to short proverbs, dark prophetic utterances, and tales illustrative of moral truths. It is the word used to designate the parables of Christ by all the evangelists except John, who uses instead *paroimia*, the literal signification of which is 'something occurring on the common road,' and hence comes to mean a common saying or proverb. The parable differs from the fable proper and from the allegory in being taken from the province of reality, from which the fable departs by attributing to the lower animals and even to inanimate objects the power of speaking and acting like man, and the allegory by representing actors and speakers who are the mere personifications of moral qualities. It differs also from the mythus in being consciously invented for a special purpose, while the mythus grows up unconsciously in popular belief. The parable is a mode of teaching peculiarly adapted to the eastern mind, and was common among the Jews before the appearance of Christ. It is exemplified in the Old Testament in the parable addressed by Nathan to David (2 Sam. xii.), and there are frequent examples of it in the Talmud.

PARABOLA, a conic section. If a right cone is cut by a plane parallel to a slant side, the section is a parabola. It may also be defined as the curve traced out by a point which moves in such a way that its distance from a fixed point, called the 'focus,' is always equal to its perpendicular distance from a fixed straight line, called the 'directrix.' The general equation in x and y of the second degree represents a parabola, when the first three terms form a perfect square. The path of a projectile in vacuo, when not a vertical straight line, is parabolic.

In the figure BH is the directrix, and F the focus of the parabola QDSAP; and, as above stated, FP = PG wherever P may be on the curve. The line FC is drawn through F at right angles to the directrix. This line FC is called the 'axis' of the curve. A, the



'vertex,' is evidently equally distant from F and C. Any line drawn parallel to AF, the axis, is called a 'diameter' of the curve. It has a property peculiar to any 'diameter' of a conic section, namely, that if a chord is bisected by it, it also bisects every chord which can be drawn parallel to the first. If in the figure the curve were produced, we should find it becoming more and more nearly parallel to the axis as it gets further away from the directrix. We shall state a few of the more important propositions regarding the parabola which are to be found in treatises on curves of the second degree.

When the vertex is taken as the origin of co-ordinates, the axis and the tangent at the vertex being taken as axes of co-ordinates, the equation to the curve is given in its simplest form, $y^2 = kx$. The constant k is called the 'principal parameter' of the diameter, which is the axis of x—that is, the axis of the parabola AF. k is the length of the chord through F at right angles to the axis, and is evidently equal to four times AF or AC. If any other point on the curve is taken as origin, the diameter through the point being the axis of x and the tangent being the axis of y, the equation has the same form, $y^2 = kx$, k being a new constant, called the 'parameter of the diameter,' passing through the origin. A parabola may be considered as an ellipse whose eccentricity is 1. It may be shown that FP and the diameter through P make equal angles with the tangent at P. We thus see that if the parabola rotates about its axis, describing a surface called a 'paraboloid of revolution,' and if this surface is a mirror, rays of light proceeding from the luminous point F are all reflected parallel to the axis.

PARABOLANI, in the early Christian church, a class of men whose chief duty was to attend on the sick and diseased. The name was originally that of the most reckless gladiators, and is derived from the Greek *parabolos*, 'desperate.' It is not known when the first fraternities of Christian parabolani were formed, but it is probable that they date from the time of Constantine. It is certain at least that at that epoch there were such functionaries in all the principal churches of the East, but nowhere were they more numerous than at Alexandria, where they formed a corps of 500 men. Theodosius the younger increased this number to 600, because pestilences and contagious diseases were nowhere more common than in Egypt. This emperor placed them under the jurisdiction of the præfectus Augustalis, who was the chief magistrate of the city; but they were appointed by the bishop, whose directions they had to follow in all that concerned their offices of charity. As the parabolani were for the most part bold men, familiar with and indifferent to death, severe laws were enacted with the view of confining them to their duties and preventing them from exciting seditions and disturbances, which were particularly common at Alexandria. By the Theodosian code their number was restricted, and they were forbidden to be present at public assemblies, and even in any court of justice, unless they had some special business there sanctioned by the law. On more than one occasion they showed themselves worthy of the suspicion in which they were held, as for example at the Council of Ephesus in 449, when a Syrian monk named Barsumas, at the head of a band of armed parabolani, committed excesses of the most outrageous kind, and terrified the council into granting all his demands.

PARACELSUS, or PHILIPPUS AUREOLUS THEOPHRASTUS BOMBASTUS VON HOHENHEIM, a celebrated empiric and alchemist, born at Einsiedeln, in the canton of Schwyz, in Switzerland, in 1493. His proper name appears to have been Höhener, which became Paracelsus by translation into Greek, in accordance with the common practice of the time. Von Hohenheim was probably an invention of his own. Dissatisfied with the means of acquiring knowledge which were within his reach in his native country, he travelled over the greater part of Europe, including Germany, France, Italy, Spain (visiting Granada, where the Arabs were still credited with knowing more of the mysteries of science than other people), England, and other parts, everywhere seeking to add to his knowledge. In the course of his travels he became acquainted with some remedies not in common use among the faculty (probably preparations of mercury), by means of which he performed extraordinary cures, and obtained great reputation. On the fame of these cures the magistracy of Basel in 1526 offered him the chair of medicine in that city, and the offer was accepted. Here he continued lecturing, sometimes in barbarous Latin, but more commonly in German, till the spring of 1528, when,

having cured a rich ecclesiastic of a dangerous disease, and being precluded by a decision of the magistracy from obtaining the stipulated reward, for which he was obliged to sue his patient, he was so enraged at the disappointment that he grossly abused the judges, and becoming apprehensive of their resentment, took his departure from the city. He now resumed his wandering life, accompanied at first by his pupil Oporinus, who, disgusted with his violence and intemperance, at length left him to pursue his wild career alone. He died at the hospital of St. Sebastian at Salzburg in 1541. The reputation of Paracelsus has suffered much with his earlier biographers on account of his obvious faults, the irregularity of his life, his violence, self-confidence, and his overweening contempt for the other physicians and men of science of his own day. For a long time he was regarded as little better than a charlatan or a madman. Later writers, however, who have studied his life and his epoch more attentively, have shown him to be entitled to higher consideration. He is often styled the Luther of science, and this appellation he deserves not only by reason of the combativeness and aggressiveness of his spirit, and his earnestness and assiduity in the cause to which he devoted himself, but also on account of the similarity of the attitude which he took up in science to that assumed by Luther in religion. As Luther turned from the decisions of councils and the decrees of popes to the Bible as the true standard of religious truth, the right of interpreting which he claimed for each individual; so Paracelsus rejected the authority of Galen, Avicenna, and other doctors, whose opinions were currently received with unquestioning submission in his day, and appealed to the observation of nature as the only foundation of science. So far he was in advance of his age; but in his methods of interpreting nature he was as much in the dark as the rest of his contemporaries, and while he treated with merited contempt all opinions in science that had no better sanction than that of being found in the writings of some old authority, he was often absurdly credulous in accepting from others any views professed to be founded on experience. Hence he gave his countenance to many of the superstitions of the age, on which account he was long and is still to some extent popularly known only as a magician and practiser of the black art. At the same time it must be remembered that he enriched science, particularly chemistry and medicine, which he regarded as intimately connected, with some valuable discoveries, and he is sometimes looked upon as the founder of modern therapeutics. Among the writings attributed to Paracelsus are some on surgery, chemistry, and theology, many of which remain unpublished. A collection of his works in eleven vols. quarto was printed at Basel in 1589; also one printed at Geneva in 1658, with a preface containing an account of the author.

PARACHUTE, a silk instrument of an umbrella shape, about 20 or 30 feet in diameter, attached to balloons, by means of which the aeronaut may descend slowly from a great height. It has a hole at the top to prevent oscillation. The first account that we have of a machine of this kind is in a French manuscript written by an Italian of Venice, and describing experiments made with one in 1617. In 1783 the French physician Lenormand made several experiments with parachutes of 30 inches in diameter at Montpellier; and shortly after the machine (enlarged to something like its present dimensions) became well known through the public descents of Blanchard in Paris and London. Garnerin was the first to suggest their use for balloonists in case of accident. See AERONAUTICS.

PARACLETE (*paraklētos*, a counsellor, comforter), in the English translation the Comforter, the Holy Ghost. Jesus promised to his disciples (John xiv. 16) that his Father would send them another Comforter, the Spirit of truth, who should abide with them for ever, teach them all things (ver. 26), and bring all his sayings to their remembrance.

PARADE, literally a prepared place (from the Latin *parare*, to prepare), and originally applied to the courtyard of a castle or any level prepared ground. It has hence come to be applied to an inspection of troops held on such ground.

PARADISE, the garden of Eden. The word is originally Persian, and signifies a park. It was introduced into the Greek language in the form *paradeisos* by Xenophon, who became acquainted with it probably during the expedition of the 10,000 Greeks. It has been introduced into modern languages as a name for the garden of Eden (and hence of any abode of happiness) through its having been used in that sense by the translators of the Septuagint.

PARADISE, BIRD OF (*Paradisea*), a genus of Insessorial or Perching Birds, allied to the Crows, and included in the Conirostral section of the order. These birds form the type of a distinct family, that of the Paradiseidæ, the members of which are distinguished by the conical form of the bill, the upper mandible being notched or indented near the tip, and the nostrils being hidden by the plumes at the base of the beak. The wings are of considerable length, and present a rounded conformation. The tarsi or ankles are elongated, of strong make, and protected by a single large plate or 'scutellum.' The outer toe exceeds the inner in length, and is joined to the middle toe at its base by a rudimentary membrane. The hinder toe is longer than the front ones, and all the nails are curved. The feathers and their peculiar disposition give to these birds a remarkable and noteworthy appearance. The feathers of the neck and sides of the body are of loose conformation, and extended from the body so as to present the appearance of expanded ruffles and plumes. These feathers are much valued as articles of ornament and decoration. The history of these birds was formerly mingled with much that was ludicrous and mythical. They were thus supposed to have no legs, to lay their eggs whilst on the wing, to suspend themselves by the tail-feathers when asleep, to feed upon dew, and never to touch the earth when living. The legs, in preparing the birds for ornaments, were torn away, and this fact may possibly have given rise to the first-mentioned fable. All these birds inhabit New Guinea and adjacent territories. The Great or Emerald Bird of Paradise (*Paradisea apoda* or *major*, Pl. CXLIV.–CXLV. fig. 10) is the most celebrated species of this genus. The head is small and ornamented with feathers, possessing a brilliant metallic lustre. The neck is coloured yellow, with a greenish tint; the body is of a rich brown hue, mottled with gold; the side and tail feathers are long, bearded, and pendent. This brilliant plumage is possessed by the males only, these birds being polygamous. The males are said to strut and display themselves before the females after the fashion of the Peacocks. This first species is found chiefly in the Molucca Islands, particularly in Papua and Aru, where they arrive with the westerly monsoons, and return to New Guinea with the easterly winds. They fly in groups numbering from thirty to forty birds, led by a member, denominated a 'king' by the Indians. In May and June, the breeding season, the plumage of the males attains its utmost brilliancy; and these latter assemble in bodies, on high trees, to display their glorious plumage; and thus constitute a spectacle which, for lustrous beauty, has hardly

a rival in the animal or vegetable world. The food consists chiefly of fruits. The voice of the males is described as loud and piercing, that of the females being of weaker character. The natives of New Guinea kill these birds, and sell the skins and plumage to the Malays, through whom they reach the centres of civilized commerce. They are caught during the night by climbing the trees in which they roost. The specific name *apoda* of Linnæus was so bestowed from the general belief that these birds wanted feet, although the great naturalist himself was fully aware of these birds possessing limbs. The Superb Bird of Paradise (*P. superba*) is a familiar species. The *P. regia*, or King Bird of Paradise, and the *P. magnifica* and *P. viridis*, are other species. These birds are said to fly against the wind, so as to avoid ruffling the feathers, and so as to keep them in an expanded state. They are said to fall to the ground when a sudden change of wind occurs.

PARADOX is that which runs counter to general idea and expectation, and appears accordingly to be incredible and incomprehensible. In literature or science we give the name of paradox to any proposition contradictory to what is generally admitted to be the correct view.

PARAFFIN. The name is applied to the solid, fatty, crystalline substance obtained by the destructive distillation of various organic bodies, such as bituminous shale, &c. Paraffin is generally obtained by heating bituminous shale in iron retorts at a low red heat; condensing the tarry products, and purifying these by distillation, washing successively with soda, water, and acid, and again distilling. Those portions of the oil which solidify in the final distillations are collected separately from the liquid portions, washed with soda and acid, and crystallized or again distilled. The partially purified paraffin is now again treated with acid, allowed to solidify, submitted to the action of centrifugal machines, and finally strongly pressed in order to remove any liquid oil which may still adhere to it. The solid substance is now melted and cast into blocks. Large quantities of paraffin are also obtained from ozokerite and petroleum.

The liquid oils obtained in the process sketched above come into commerce under the general name of paraffin-oil, the lighter oils being used for illuminating and the heavier for lubricating purposes.

The amounts of paraffin and of light and heavy oils obtained from 100 parts of different samples of shale are stated in the following table:—

	Burning Oil.	Lubricating Oil.	Paraffin.
English bituminous shale,	24·2	40·0	0·12
Prussian do.	25·6	43·0	0·11
Westphalian do.	27·5	13·7	1·11
Rhenish do.	18·3	38·3	5·00

The amount of paraffin obtained from the celebrated Boghead cannel or Torbanehill mineral amounted to about 1·5 parts per 100 of coal.

Pure paraffin has a specific gravity of about ·877; it melts about 47°, but the melting-point varies in different specimens. Paraffin may be crystallized from an ethereal solution. On account of the great inertness and general inactivity of this substance it has received its name (*parum-affinis*). Oxidizing agents exert but little action on paraffin, generally speaking; chlorine is without action on it at ordinary temperatures, but if passed into molten paraffin it withdraws a part of the hydrogen, and forms chlorinated derivatives.

From the most recent researches upon the chemical constitution of paraffin it would appear that it is a mixture of hydrocarbons of the marsh-gas or C_nH_{2n+2} series with those of the olefine or C_nH_{2n} series.

The name paraffin is generically applied to all the hydrocarbons of the marsh-gas series.

PARAGUAY, a name at one time used in a very extensive sense, so as to include the whole of the immense regions of South America between lat. 16° s. and the Straits of Magellan, and between Chili and Peru on the west, and Brazil on the east, now confined to the republic, extending from lat. 22° to 27° 20′ s., and lon. 54° 40′ to 58° 40′ w. Its western boundary is formed by the river Paraguay, which separates it from Bolivia and the Argentine Republic, and its southern and south-eastern by the Paraná, which separates it from the Argentine Republic and Brazil. Its north-eastern boundary, as fixed by the treaty with Brazil of January, 1872, begins in the east at the Salto grande de siete Quedas, on the Paraná, in lat. 24° s., then proceeds up the river Igatim as far as the Serra Maracaju, which it then follows northwards to the sources of the Apa, finally turning west along this river till it joins the Paraguay about lat. 22° s. The area of the state is 56,693 square miles. The whole surface belongs to the basins of the Paraguay and Paraná, a mountain range of considerable elevation stretching between them, north to south, so as to form their watershed, and send the drainage in opposite directions, but nearly in equal portions. The distance of the watershed from the river scarcely anywhere exceeds 100 miles, and hence the tributaries by which the drainage is conveyed are more remarkable for their number than their magnitude. By far the largest is the Tibicuari, which, owing to an eastern bend in the watershed, has its course considerably prolonged, and being augmented by several large affluents from the north, becomes a noble stream before it reaches the Paraguay. From the mountain region the surface rapidly descends, first presenting a finely-diversified succession of lower heights, and then spreading out into rich alluvial plains, which not unfrequently, in the immediate vicinity of the larger streams, are converted into swamps. The climate, though tropical, has its excessive heat greatly modified by the inequalities of the surface, but concurs with the natural fertility of the soil in producing a vegetation of almost unequalled luxuriance and grandeur. In the forests are found at least sixty varieties of timber, admirably adapted for all purposes in which elasticity, durability, or buoyancy is required; dye-woods, gums, drugs, perfumes, vegetable oils, and fruits in almost endless variety. Many of the hills are literally covered with the *yerba maté* or Paraguay tea (see MATÉ), no contemptible substitute for the tea of China, and the principal beverage of one-half of South America. The larger plains are roamed over by immense herds of cattle, which, though scarcely required for food in a country otherwise so richly provided, yield valuable products in the shape of hides, tallow, hair, horns, bones, &c.; and on all the alluvial tracts where cultivation is attempted with instruments, however primitive, sugar-cane, cotton, tobacco, rice, maize, and in short the greater part of the most valuable products, both of the tropical and the temperate zones, are raised in profusion. In 1882 the imports were valued at £264,425, consisting chiefly of textile fabrics, 85 per cent of which are sent from Britain; the exports were valued at £330,135, and comprised mainly maté and tobacco. The only railway in Paraguay is a line of 45 miles from Asuncion the capital to Paraguari.

Paraguay was originally a Spanish colony. The first settlement which they made was in 1535. In 1608 a number of immigrant Jesuits succeeded in obtaining the supreme power in the new colony, and established a powerful and well-organized government, which lasted till 1758, when it was over-

thrown by the Brazilians and Spaniards. In the contest of the Spanish colonies with South America its isolated position gave it decided advantages, and almost at once, by a single effort, it succeeded in emancipating itself from the Spanish yoke, but it was only to fall under one still more galling. Dr. Francia, who commenced his political career in 1811 as secretary to the revolutionary junta, having been elected consul, exchanged the name for that of dictator in 1814, and thenceforward till his death in 1840, at the advanced age of eighty-four, retained it with a firm grasp both in name and in reality. His tyranny, justly regarded as one of the most remarkable political phenomena of modern times, was maintained by a rigorous system of espionage and by a strict prohibition of all intercourse with other nations. On the death of Dr. Francia a consular government was established, which, however, only lasted till 1844, when Don Carlos Antonio Lopez was elected president for ten years. By a decree issued by him on the 20th of May, 1845, the country was declared free and open both to foreigners and commerce. The benefits of this liberal arrangement were, however, in a great measure frustrated by the selfish policy of the government of Buenos Ayres, which, taking undue advantage of its command of the outlet of the La Plata, crippled the trade not only of Paraguay, but of the extensive regions beyond it, to which the Paraná and Paraguay furnish the only available means of transport. War was ultimately declared by Paraguay against the adjoining state, and the defeat and flight of Rosas, the dictator of Buenos Ayres, in February, 1852, changed this state of affairs. Buenos Ayres then recognized the independence of Paraguay, and in the same year, in accordance with a decree of the provisional director of the Argentine Confederation, the navigation of the Rio-de-la-Plata, the Paraná, and the Uruguay was opened to all foreign vessels under 120 tons register. Don Carlos Lopez remained president of Paraguay till his death in 1862, when he was succeeded by his son Don Francisco Solano Lopez. The new president began well. Having had a European education, he was favourable to European ideas, and gave himself with ardour to the development of the resources of the country. He concluded treaties of commerce with England, France, the United States, Brazil, &c., and did all in his power to promote the growth of agriculture and industry in the land. But just when Paraguay seemed about to enter on a career of prosperity previously unexampled in the history of the country, a disastrous war with Brazil and the Argentine Republic broke out (end of 1864), which lasted for five years, laying waste the country and greatly diminishing the population. The war came to a close with the death of Lopez in 1870. The country, exhausted and depressed, was obliged to yield to the demands of Brazil, and in January, 1872, accepted the treaty by which it was limited to its present boundaries. A popular constitutional government has since been established. Pop. according to census of 1873, 221,079; according to official report of 1879, 346,048, the females (as a consequence of the war) far exceeding the males.

PARAHYBA, a maritime province of Brazil, situated between Rio-Grande-do-Norte on the north and Pernambuco on the south, and stretching along the coast for about 70 miles, with a length of not less than 280 miles; area, 28,846 square miles. It consists of ramifications of the cordillera Borborema, descending gradually toward the coast, and separated by extensive valleys, each watered by a considerable stream. Much of the soil is of a sandy texture, but rich alluvial tracts occur along the banks of the streams. These are chiefly devoted to the cultivation of sugar-cane or rice, while many of the slopes rising from them are well adapted for mandioc, cotton, millet, and tobacco. A singular climatic phenomenon prevents any great development of agriculture. At irregular intervals, varying from four to seven years, there is in the high-lying districts of the interior, and more rarely in the whole province, no rainy season, in consequence of which there is a failure of crops and terrible mortality among cattle. Extensive forests, furnishing valuable timber, gums, and balsams, crown many of the loftiest summits. Pop. (estimated at end of 1882), 432,817.

PARAHYBA, a town in Brazil, capital of the province, and situated on the river of the same name, about 16 miles from its mouth. It has an old Jesuit college, occupied partly by the governor and commandant, and partly by the House of Assembly and law courts; a college, several churches and convents, a town-house, and custom-house. The harbour at the town is easily accessible, and much frequented by coasting-vessels, which generally load with cotton, sugar, Brazil-wood, gums, and balsams. Pop. 16,000.

PARAKEET, or PARROQUET (*Pezophorinæ*), a sub-family of the Psittacidæ or Parrots, characterized by the generally small size of body, and of the beak, the upper mandible being less convex or arched than in the Parrots. The tail-feathers are very long in the Parroquets. In other respects they are allied to the true Parrots (which see). In their distribution the Parakeets are confined to the Eastern Hemisphere. The islands of the Eastern Archipelago form the chief habitat of these birds, but species also occur in India and Australia. Amongst the most familiar forms included in this sub-family are the Rose-ringed and Alexandrine Parroquets. The former (*Palæornis torquatus*) is found in India and on the eastern coasts of Africa. It averages 15 inches in length, the tail making up nearly two-thirds of this extent. The body-colour is a bright green, the specific name being derived from the presence of a pink circle round the neck. The Alexandrine Parroquet (*P. Alexandri*) of India is a nearly-allied species. These birds may be taught to speak with distinctness. Many other species of the genus Palæornis occur in India. They devastate the grain-crops in a marked degree. From three to four eggs are produced, the nest being situated in holes of trees and similar places.

The Ground Parakeets of Australia are so named from their terrestrial habits, these forms never perching on trees, but inhabiting flat grounds, and living amongst the reeds and grass of swamps. These birds generally live in solitary pairs. The nest is of simple construction, and situated on the ground. The Common Ground Parakeet of Australia (*Pezophorus formosus*) possesses a green and black plumage, the tail being similarly coloured, and the body-feathers having each a band of dark-brown hue. It measures about 12 inches in length, inclusive of the tail. The Grass Parakeets of Australia, of which the small Warbling Parakeet (*Melopsittacus undulatus*, Pl. CXL.–CXLI. fig. 5) is a good example, are also to a great extent terrestrial in habits. They inhabit the central flat lands of Australia, and feed on the seeds of the grasses covering the plains. They perch on the Eucalypti or Gum-trees during the day, and the nests are situated in the hollows of these trees. The English name of the species above-mentioned is derived from the warbling notes they emit —a song differing widely from the general coarse screech of the parrot tribe. The genus *Euphema* also includes several representative forms of Australian Grass Parakeets.

PARALLAX, the apparent change of place which bodies undergo by being viewed from different points.

The term has become technical in astronomy, and implies the difference of the apparent positions of any celestial object when viewed from the surface of the earth and from the centre of either the earth or the sun. It is usual to refer all astronomical observations to either of these two points. The 'apparent place' of a heavenly body is its place as seen in the heavens by an observer. Its 'true' or 'mean' place is its place in the heavens as if viewed from the centre of the earth. We see that the altitude of a heavenly body is depressed by parallax, and the parallax is greatest when the object is in the horizon, and least when in the zenith. The horizontal parallax of the moon is greater than that of any other heavenly body, as the moon is nearer than other bodies. If two astronomers, one south and the other north of the equator, on the same meridian, observe the altitude of the same heavenly body (the moon, for example) at the same instant, it is easy to show by a diagram that the parallax may be calculated when the latitudes are known, and from the parallax, knowing their distance asunder on the earth, the distance of the earth from the body and the body's magnitude may be found. This parallax is called 'diurnal' or geocentric. The 'annual' or heliocentric parallax of a celestial object, such as a fixed star, is measured by observing its displacement when viewed from the two extremities of the earth's orbit. Even with this enormous 'base-line' (to use a surveyor's term) the angle between the two lines to the star *a Centauri*, which seems to be the star nearest us, is only 0·913″, and this corresponds to a distance of about 20,656,000,000,000 miles.

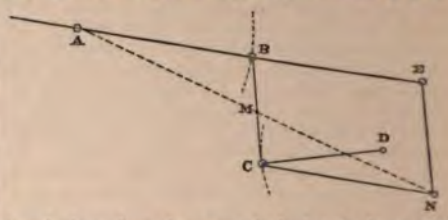
The term 'parallax' is also employed to denote the non-coincidence of the cross fibres in a telescope with the focus of the eye-glass. When there is parallax, by slightly changing the position of the eye we get the cross fibres to coincide with different points in the image of a distant object.

PARALLEL LINES, straight lines in the same plane which never meet, no matter how far produced.

PARALLEL LINES, in sieges, are those trenches which generally run parallel with the outlines of the fortress. They serve as places for concentrating the forces to be directed against the fortress, and are usually 3 feet deep, from 9 to 12 feet wide, and of a length adapted to the circumstances of the case. Generally three parallel lines are requisite before a breach is made. The last receives the apparatus destined to effect the breach, and is made on the glacis itself. The communication from one to the other is effected by means of ditches. Vauban first made use of them in 1673, at the siege of Maestricht.

PARALLEL MOTION, a mechanical contrivance employed by Watt to communicate the alternate pushes and pulls of the piston-rod of a steam engine to the end of a vibrating beam, and which prevents the action of forces tending to destroy the right-line motion of the piston-rod. The motion given to the end of the rod is not accurately in a straight line, but it is very nearly so. Watt's parallel motion is still employed in all stationary beam-engines. In marine beam-engines the arrangement employed is the same in principle, but differs somewhat in form from that used by Watt. In direct-action engines, that is, where the motion of the piston is at once communicated to the crank by a connecting-rod, the piston-rod is constrained by guides to move in a straight line.

In the figure AE is half the beam; it is supported at A, and vibrates about A. Thus, any point in the beam moves in an arc of a circle whose centre is A. E is the point to which the motion of the piston-rod is to be transferred. DC is a rod fixed at D, and vibrating about D. Thus, C moves in an arc of a circle with D as centre. B moves in an arc of a circle with A as centre, and the ends of the rod BC are therefore constrained to move in different paths. When the motion of this rod is examined it will be



found that there is a certain point in it, M, which moves very nearly in a straight line, and it may be shown that BM : CM :: CD : AB. Thus, if the end of the piston-rod were fastened to M, the mechanism would keep it moving very nearly in a straight line when giving a vibratory motion about A to the beam. Again, if CN and EN are rods of such lengths that BENC is a parallelogram, and if they are attached by a free joint at N, and if N is in the line AM produced, then N will also move in a straight line. It is to N that the piston-rod is attached, the air-pump rod of the steam-engine being attached to M. Watt very clearly stated the principle of the parallel motion when he said that the points B and C described arcs whose convexities lay in different directions, and compensated for each other's variation from a straight line; so that a certain point M at the top of the pump-rod, lying between those convexities, ascended or descended in a straight line.

PARALLELOGRAM OF FORCES, an important dynamical principle, deduced by Newton from an axiom called the parallelogram of velocities and a definition of force. If two forces acting in different directions on a particle at the same time be represented in magnitude and direction by two straight lines meeting at the particle, their resultant effect in giving motion to the particle is that of a force represented in magnitude and direction by the diagonal (terminating in the particle) of the parallelogram, of which the two former lines are two sides. See MECHANICS.

PARALLELS OF LATITUDE, the imaginary lines which pass round the earth in circles whose planes are at right angles to the earth's axis, and by means of which degrees of latitude are measured on the meridians. They are numbered northwards and southwards from the equator, making 90° from that line to each of the poles. For the methods of finding the latitude of a place, see LATITUDE.

PARALYSIS. See PALSY.

PARAMAGNETISM. See MAGNETISM (end of article).

PARAMARIBO, the capital of Dutch Guiana or Surinam, about 12 miles above the mouth of the river Surinam. It is a pretty town. The streets are planted with lemon, orange, and tamarind trees; and the houses have all the appearance of Dutch neatness and cleanliness. It has a government-house and other public buildings, Calvinistic, Lutheran, Moravian, and Roman Catholic churches, two synagogues, an orphan hospital, a military hospital, and large barracks. It is the centre of the Dutch West Indian trade, for which it is furnished with facilities by three canals which intersect the town and the navigable river. The principal exports are sugar, coffee, cotton, cacao, and indigo; the imports, grain, salt, provisions, and European goods. Pop. (1881), 27,416.

PARAMATTA, or PARRAMATTA, a town in New South Wales, in the county of Cumberland, on a river or rather arm of the sea of the same name, in a

beautiful and well-cultivated district, 14 miles west of Sydney. It occupies a large space, consisting of houses built of brick or white freestone, generally detached from each other, partly surrounded by gardens, and arranged in regular streets, of which the principal one is about 1 mile long. The public buildings include a government-house (now leased as a boarding-house), places of worship for Episcopalians, Presbyterians, Methodists, Baptists, Congregationalists, Roman Catholics, &c.; 2 orphan schools; asylums for the infirm and destitute, for the insane, &c.; mechanics' institute, and several schools. Woollen cloth is manufactured to some extent; and in the vicinity there are large salt-works and copper-smelting furnaces. Much fruit is grown in the district. The town is the oldest in the colony except Sydney. It returns one member to the Legislative Assembly of New South Wales. Pop. (1881), 8433.

PARAMATTA, a light twilled fabric with a weft of combed merino wool and a cotton warp. It was invented at Bradford, in Yorkshire, where it is still largely manufactured.

PARANÁ, a river in South America, the largest except the Amazon, and draining a larger basin than any other river in the New World except the Amazon and the Mississippi. It is formed by the junction of two streams, the Rio Grande and the Paranahyba, which meet about lat. 19° s. and lon. 51° 40′ w. in Brazil. The former, which is often regarded as the true head of the Paraná, rises in the Brazilian province of Minas Geraes, about lat. 22° s. and lon. 43° 30′ w.; and the latter in the province of Goyaz, near the borders of Minas Geraes, about lat. 18° s. and lon. 47° 30′ w. At the point where the two headwaters of the Paraná meet, a point about 400 or 500 miles from the source of the Rio Grande, the river takes a southerly course, having previously flowed in a westerly direction in both its branches. At this point it separates the province of Goyaz, on the right bank, from that of São Paulo on the left, and as it flows south separates the province of Matto Grosso from São Paulo and Paraná, and the country of Paraguay from the Brazilian province of Paraná, and from the province of Corrientes, belonging to the Argentine Confederation. About lat. 27° s. the stream again turns westwards, till it receives the Paraguay on its right bank at the town of Corrientes, about lon. 58° 40′ w., after which it again turns south through the Argentine Confederation, and finally falls into the estuary of the La Plata. Its principal tributaries besides the Paraguay are the Tiete or Anhemby, the Paranapanema, Ivahy or Peixe, Piquery, Taquary, and Iguany or Curitiba, on its left bank; and the Salado on its right bank. All the tributaries on its left bank are comparatively short, but the Salado, which it receives in the Argentine province of Santa Fé, is a stream of 1000 miles in length. Its length, from its sources to its junction with the Paraguay, is probably 1500 miles, and thence to the sea 600 miles more. In breadth, current, and volume of water, the Paraná has ten times the magnitude of the Paraguay, which is itself superior to the greatest European rivers. But owing to its rapid descent, and the mineralogical character of the country through which it flows, it is not navigable up for more than 250 miles to the Salto de Yguazu, lat. 25° 50′ s., above which for 100 miles the stream is but a succession of rapids and cascades, as far as the Gran Salto, lat. 24° 4′ s., where the great river, previously a league in breadth, rushes through a chasm only 60 yards wide. In the lower part of its course, below its junction with the Paraguay, the Paraná is everywhere deep, broad, and unobstructed, except in the delta, where the deepest channel has often but 2½ fathoms. December is the month in which the Paraná conveys to the sea the greatest volume of water.

PARANÁ, a province of Brazil, bounded on the north by the province of São Paulo, east by the Atlantic, south by the provinces of Santa Catharina and São Pedro, and by the Argentine Confederation, and west by Paraguay and the province of Matto Grosso; area, 85,429 square miles. It is as yet but thinly inhabited, but as the soil is fertile and the climate good, it is yearly attracting a larger population. The principal rivers are the Paraná, which forms its western boundary, the Ararasira, the Curitiba or Iguany, the Taquary, Piquery, Ivahy or Peixe, and the Paranapanema, which flows along the greater part of its northern frontier. The province was formed in 1855. Its chief town is Nuranda. Pop. in 1881, 190,348.

PARAPET (from the Italian *parapetto*, which is again derived from *parare*, to protect, and *petto*, the breast), in fortification, a work, usually of earth, intended to protect the troops within the ramparts, as well as the pieces of artillery used in the defence. It has three sloping surfaces, an outer, upper, and inner; but the upper surface slopes only very gently downwards and outwards. It is intended for the defenders to rest their rifles or muskets on when firing. In order to fire the defenders ascend to a ledge called a banquette, about half-way up the parapet. The defences round the roofs of castles are also called parapets.

In architecture the term parapet is applied to the structures placed at the edges of platforms, balconies, roofs of houses, sides of bridges, &c., to prevent people from falling over. They are sometimes plain and sometimes ornamental.

PARAPH, a particular character or flourish added to the signature of a person, to render the counterfeiting of it more difficult. With some nations, as the Spaniards, they are as common and take as much room as in the middle ages; indeed, they often affix the paraph without the name to official papers.

PARAPHERNALIA are the woman's apparel, jewels, and other things, which, in the lifetime of her husband, she wore as the ornaments of her person, to be allowed by the discretion of the court, according to the quality of her and her husband. The husband cannot devise such ornaments and jewels of his wife, though during his life he has power to dispose of them. But if she continues in the use of them till his death, she shall afterwards retain them against his executors and administrators, legatees, and all other persons, except creditors, where there is a deficiency of assets.

PARAPHRASE, the setting forth of the sense of a writing in a different form, mostly in a more clear and ample manner than it is given in the original. When the original is in a foreign language the paraphrase differs from a mere translation, in the circumstance that the object of the paraphrase is always to explain or to develop more fully the meaning of the original. A paraphrase in verse of a passage of Scripture differs on the one hand from a mere versification of the original, and on the other hand from a hymn or poem in which such a passage is only taken as a text. It takes more latitude than the former and less than the latter. It ought to contain nothing more than an expansion of the ideas already contained in the passage on which it is based, while the hymn or poem may contain ideas which are merely suggested by its subject.

PARASANG, a Persian measure of distance used both in ancient and modern times. It is reckoned by Herodotus and Xenophon equivalent to 30 stadia (a little under 3½ English miles); but other Greek writers represent it as equal to 40 or even 50 stadia.

Its modern Persian name is *ferseng*, and its length is estimated at from 3½ to 4 English miles.

PARASELENE, a mock moon, seen usually in a ring round the moon.

PARASITES, the name applied to those animal forms which attach themselves to the exterior, or inhabit various situations in the interior, of the bodies of other animals—standing thus to the infested animals in the relation of 'guests' to 'hosts.' Parasitic animals are of various kinds and degrees of organization, and belong to different groups of the animal kingdom, ranging from the Protozoa even to the Vertebrata. Among the Protozoa we thus find the *Gregarinæ* of Dufour exemplifying parasitic forms. These colourless microscopic animalcules inhabit the alimentary tract of beetles, cockroaches, and other insects, and also occur in the digestive system of earth-worms. Each Gregarina consists simply of a particle of protoplasm or sarcode, with ill-defined walls, and containing a nucleus and nucleolus. These animals vary in size from that of the head of a pin to ½ inch in length. The body may be smooth, but may also be provided with hooked processes at one extremity, with bristles, spines, or cilia. The reproductive history of these forms exhibits an interesting series of phenomena. Two Gregarinæ coalesce—or one animalcule of itself may exhibit the phenomena—and form a globular or spherical mass surrounded by a cyst-like wall or envelope. The interior or contents of the cyst soon divide by a process of segmentation (analogous to that seen in the division of the egg-yolk in higher animals) into a number of minute spindle-shaped bodies, termed *pseudonavicellæ*. These latter escape from the cyst by its rupture, and such as find their way into water become developed each into a simple Gregarina, resembling that from which it was derived. From the water these fresh Gregarinæ gain admittance to the alimentary canal of their hosts, to become parasitic in their turn. Various species are known. The *Gregarina Scnuridis*, *G. Sipunculi* (of the Spoon-worms), *G. Sieboldii*, and *G. gigantea* (of the Lobster), are the most familiar forms. The *Psorospermiæ* are minute parasitic Protozoa, the exact zoological position of which is of doubtful nature. These forms are found upon or within the bodies of many fishes. Each consists of an elongated, rounded, or oval body, terminated by a tail-like process. Two vesicles generally exist towards the anterior part of the protoplasmic body. A globular mass may also be observed within the body, and this mass may give origin to bodies like the 'pseudonavicellæ of Gregarinæ. On this account Lieberkühn has regarded the Psorospermiæ as immature Gregarinæ undergoing development. Balbiani regards them, on the contrary, as vegetable parasites. And as regards the analogies of the Gregarinæ themselves, by Hæckel, these latter have been considered as *Amœbæ* modified and degenerated for a parasitic life. Other naturalists (Van Beneden, &c.) deny this; whilst others variously regard them as plant-forms, and as belonging to the Echinozoa or Annuloida.

Regarding parasites in general it may be safely asserted that a modification of structures and parts is observable in all parasitic forms, as adapting them for the stationary life they lead. Thus their structure will usually be found to be much lower than that of the animals to which, in the zoological series, they are most nearly related. And in their development it must also be noted an opposite and generally complicated cycle of changes is usually to be discerned. In some of the true Entozoa, to be presently alluded to, the developmental cycle is of an exceedingly intricate kind, involving changes of *habitat* and of hosts, and regulated by certain fixed conditions, the failure or absence of which results in the death or destruction of the developing parasite.

The group which includes the Tape-worms, Round-worms, Flukes, and other most typical parasites, is the class *Scolecida* of Huxley, which forms a pretty clearly-defined group of the sub-kingdom Echinozoa or Annuloida. In a general sense, but not strictly comprehending the Scolecida—many of which are not parasitic—the term *Entozoa* has been employed to designate certain members of that class. And the name is still used to indicate such forms as in habits are exclusively parasitic, although this use of the term groups together beings of widely different structure. The Tape-worms (*Tæniada*) form the chief group of the class Scolecida. These animals, which are not true worms in any sense of the word, inhabit the digestive tract of warm-blooded vertebrate animals, different species inhabiting different and distinct animals; even certain members of the human race being infested by special forms of this group. The entire organism consists of a number of joints or *proglottides*, each of which constitutes a zoöid or semi-independent animal. The entire worm, often of great length, is thus a compound form, the *head* segment, or *nurse*, constituting the true or active animal centre, which, by budding posteriorly, produces the flat segments or joints. Each joint or proglottis contains a perfect reproductive apparatus, by means of which numerous eggs are produced. (See TAPE-WORM.) The eggs of the joints escape from the body of the host, being incapable of further development within the same body in which the parent organism resides. If the eggs gain access to the body of a second warm-blooded vertebrate they become developed into little *Scolices*, or *hydatids*, or *cystic worms*, as they were formerly termed. These immature individuals generally ensconce themselves in the muscular tissues of their first host, and in this situation can undergo no further development, unless the muscles with their contained 'Scolices' be swallowed by another warm-blooded animal. In the latter case the second and final stage of development ensues. The Scolex attaches itself by its head—which becomes that of the future tape-worm—to the walls of the bowel, and by a process of budding produces the proglottides or segments, each with its contained ova, and each of which will in turn repeat the details of the same life-history. The ova of the tape-worm of man thus escape from the human body, and commonly lodge in the pig's flesh, constituting 'measly' pork. In the pig the Scolices proceed no further in their development; but if the affected pork be eaten by man the Scolices within the human body give rise each to a perfect tape-worm. In the same way the Scolices or cystic-worms of the mouse (*Cysticercus fasciolaris*) become, when swallowed by the cat, the characteristic tape-worm of that animal (*Tænia crassicollis*). The Scolex of the hare or rabbit (*C. pisiformis*) develops similarly into the tape-worm of the fox (*T. pisiformis*). The *Cysticercus cellulosæ* of the pig becomes the *Tænia solium* or common tape-worm of man. The Scolex of the ox, causing the 'measly' meat of that animal, becomes the other common tape-worm of man (*T. mediocanellata*). The tape-worm of the dog (*T. serrata*) is derived from the *Cœnurus cerebralis* or cystic-worms of the sheep's brain—the development of which causes the disease known as 'staggers' in the latter animal. The cystic-worms or Scolices, thus shown to be the immature forms of the tape-worms, were formerly regarded as distinct forms. Man occasionally reverses the position, and becomes the receptacle of the cystic-worms, which develop into the tape-worms of lower animals. The 'Hydatids' of man, constituting a serious lesion of the human liver and other organs, are merely the

Scolices of the dog's tape-worm (*T. echinococcus*), which unfortunately have gained admittance to the human body. In the human body they undergo no further development, but cause, by the presence of the tumour or cyst they form, much annoyance or even death. If swallowed by the dog each Scolex develops into the characteristic tape-worm of that animal. The complicated development through which these forms thus pass, and the many chances of destruction which await the countless ova discharged from the affected animals, constitute providential means whereby the development of these forms to an annoying extent is checked and prevented. Otherwise such animal-pests would soon threaten to exterminate their hosts.

The Trematoda or 'Flukes' form parasites occurring chiefly in the gills of fishes and in birds, &c., the *Distoma hepaticum* inhabiting the liver of the sheep, and causing the disease known as 'rot.' In these forms the body is rounded or flattish, and they do not form compound organisms, as in the tape-worms. *Distoma lanceolatum* is another familiar species. *Diplostomum* is a nearly-allied form, and occurs in the eyes of the perches and other fresh-water fishes. The young Distomæ, produced from the eggs of the parent-body, generally escape into water, and swim actively about by aid of a long tail, each being termed a *Cercaria*. These Cercariæ next gain admittance to the body of some mollusc, such as the Fresh-water or Pond Snail, where they become encysted, and produce other progeny by gemmation or budding. These 'nurses,' or encysted Cercariæ, soon rupture and burst, and the liberated embryos, escaping into the water, gain admittance to the body of the sheep, fish, or other ultimate host, and there become developed into the mature 'Flukes.'

The Round-worms, included in the group *Nematelmia*, include the 'Thornheaded-worms' (*Echinorhynchus*) of pigs, birds, and fishes; the *Gordiaceæ* or Hair-worms of insects; and the Round and Thread Worms (*Ascaris* and *Oxyuris*), inhabiting the human alimentary canal. (See NEMATELMIA.) The Trichina and Guinea-worm are also included in this latter division.

Among the lower Crustacea, as representing the great section of the Annulose animals, many examples of parasites are found. The *Epizoa*, represented by *Lernæa*, *Argulus*, *Achtheres*, *Peniculus*, &c., attach themselves to the bodies of fishes. The *Lernæa monilaris* thus imbeds itself in the eye of the sprat. (See LERNÆA.) *L. gobina* occurs on the gills of the Goby (*Cottus gobio*), and *L. radiata* is found in the mouth of *Coryphæna rupestris*. *Chondrocanthus* lives in the gills of the Soles and Plaice. *Ergasilus* is met with sometimes in immense numbers in the gills of certain fishes—for example, *Pagrus*. *Achtheres* infests the eyes, mouth, and tongue of the Perch. *Lamproglena* is found in the gills of the Chub, and *Nicothoë* infests the same structures in the Lobster.

Among Insects examples of parasites are found in the ordinary Lice (see LOUSE), and in the *Mallophaga* or Bird Lice of Mammals and Birds. The Strepsipterous insects are represented solely by the *Stylops* (which see), or Bee-parasites, the females of which are footless and wingless, and reside in the bodies of bees, wasps, &c., the head protruding from between the abdominal segments of the host. The larvæ of *Meloë* (which see), a species of beetle, apparently attach themselves to wild bees in a manner similar to the female Stylops.

Certain fishes may be said to exemplify parasitism in a certain sense. The Hag-fishes, or *Myxinoids* (which see), are thus found within the bodies of other fishes, such as the Cod, &c., into whose bodies they bore their way by means of the large palatal fang with which the mouth is provided. See also LERNÆA, MELOE, NEMATELMIA, TAPE-WORMS, &c.

PARASITES, or PARASITICAL PLANTS, in botany, such plants as grow on others, from which they receive their nourishment. In this class are many fungi, such as the *Uredo caries*, which produces the formidable disease called bunt to which wheat is liable. Among larger parasites are the well-known mistletoe, a parasite on the apple, beech, and oak; and the genus Rafflesia, belonging to Sumatra and Java, the species of which bear gigantic brown-coloured flowers without any leaves. Some parasites derive their nourishment by means of suckers from the roots of the plants upon which they grow, while others are fed by the sap from the trunk or branches. Among the former are the Broom-rapes (*Orobanche rapum*, *Orobanche ramosa*, &c.), Toothwort (*Lathræa squamaria*, a plant of the same order as the Broom-rapes), &c; while the mistletoe is an example of the latter. Dodder (*Cuscuta*) is an instance of a parasite which is not originally such, growing at first from seed, but afterwards attaching itself to the stems of other plants, and deriving its support thence. Parasites are distinguished from *epiphytes* (such as the *Tillandsias* and *Bromelias*), inasmuch as the latter, though they grow upon other plants, are not nourished by them, being able to draw their support from the atmosphere, or partly from the inorganic substances which collect on the bark of the trees to which they attach themselves.

PARASITIC DISEASES, such as are produced by parasitic animals or plants. Among the animals producing such diseases are the Guinea-worm, the Louse, the Trichina, Tape-worms, Ascarides, &c. The vegetable parasites which produce disease in animals are either fungi or algæ. Ring-worm, which is produced by a fungus called *Tricophyton* (hair-plant), is an example of this class of diseases. The most terrible of parasitic diseases is what is known as the Fungus Foot of India, which is caused by a fungus eating its way through the tissue and into the bones of the foot and the lower ends of the tibia and fibula, and which ultimately kills the patient by exhaustion, unless this result is prevented by timely amputation of the affected part. The disease is confined to India and the north-eastern shores of the Persian Gulf, and is said only to attack natives.

PARASOL. It appears from ancient monuments and descriptions that this well-known instrument, or something exceedingly resembling it (called by the Greeks *skiadeion*, and by the Romans *umbraculum* or *umbella*) was used among the ancients, not for the purpose so much of preservation from the rays of the sun as in religious ceremonies and processions. In the festivals of Dēmētēr (Ceres) and Athena (Minerva) the young females who celebrated them bore, among other sacred instruments, the parasol: it was, in fact, one of the most ancient marks of dignity that we find indicated either by relics of art or by authors. In process of time, when the Romans began to lay aside the simple habits of their forefathers, the parasol, by a natural transition, began to be used for the purpose to which it is still applied. The matrons particularly used to be followed by slaves, whose office was to protect the delicacy of their charms by intercepting the solar heat by the agreeable shade of the parasols. They were constructed of wands or twigs, disposed in such a manner as to admit of their being put up or down, in much the same way as those used at the present day. The substance employed was often of rich stuff, such as silk, &c., of showy colours, and elegantly embroidered. In many countries, where the sun is powerful, it is well known that parasols are used by men as well as women.

PARBUCKLE, a method of raising or lowering any cylindrical body, such as a barrel, by an inclined plane. It consists in throwing a rope round a post fixed on the level from which the object is to be lowered, or to which it is to be raised, making the ends of the rope of the same length and passing them under and round the object to be raised or lowered. In raising or lowering the object one or more men, standing on the higher level, take hold of each end of the rope, and shorten or lengthen the amount of rope paid out according as they wish to raise or lower. By this method the barrel, or whatever else it may be, is made to serve as a pulley for itself, and there is the same diminution of weight to be overcome as when anything is raised or lowered by means of a rope working in a pulley to which it is attached, in addition to the diminution of weight by the inclined plane; that is to say, the resistance at the two ends of the rope is just one-half of the weight of the object as felt on the inclined plane, or one-fourth of that weight at each end separately.

PARCÆ. See FATES.

PARCHIM, a town of Germany, in the Grand-duchy of Mecklenburg-Schwerin, on the Elde, 21 miles south-east of Schwerin. It has manufactures of woollen and linen cloth; large flour, oil, paper, and saw mills; a chicory-factory, &c. It is the birth-place of Count von Moltke. Pop. 9063.

PARCHMENT, used for writing, is prepared from the skins of sheep and she-goats. These, after being steeped in pits impregnated with lime, are stretched upon frames, and reduced by scraping and paring with sharp instruments. For the best kinds of parchment pulverized chalk, or slaked lime, is rubbed on upon one side with a pumice-stone resembling a muller, which smooths and softens the skin and improves its colour. The other side is rubbed with the pumice-stone without the chalk or lime. Some manufacturers omit the use of chalk or lime altogether, to escape the danger of fraying the surface. After it is reduced to something less than half its original thickness, it is smoothed and slowly dried for use, during which processes it is still kept tightly stretched on the frame. Vellum is a similar substance to parchment, made from the skins of very young calves, and also of kids and dead-born lambs. The skins of he-goats, she-goats, and wolves are prepared in the same way for drum-heads, and those of the ass for kettle-drums and battle-dores. Next to the papyrus the skins of animals, in the form of parchment and vellum, were extensively used for writing by the ancients from a remote period. Its extensive use in ancient times is said to date from the occasion on which Eumenes, king of Pergamus, attempted to found a library at that city about 200 B.C., which should rival the famous Alexandrian library. Ptolemy Epiphanes, then king of Egypt, jealous of his success, made a decree prohibiting the exportation of papyrus. The inhabitants of Pergamus set about manufacturing parchment as a substitute, and formed their library principally of manuscripts on this material, whence it was known among the Latins by the name of *Pergamena*, which is the origin of our word parchment. But this was not the first time that parchment was used for writing. The Hebrews had books written on the skins of animals in David's time; and Herodotus relates that the Ionians, from the earliest period, wrote upon goat and sheep skin, from which the hair had merely been scraped off. The term *membrana* was also applied to parchment by the Romans. Parchment was at first yellow; it was afterwards made white in Rome, and sometimes also of a violet colour, the writing on which was often in silver. At present any colour can be given to it.

PARCHMENT, VEGETABLE. See PAPER.

PARDON. In England, in nearly all cases of crimes except where there is an impeachment, a pardon from the crown may be granted before a trial as well as after; and it stops further progress in the inquiry and prosecution at whatever time it is granted. In cases of impeachment no pardon can now be granted by the crown while the prosecution is pending; but after conviction of the offender it may be granted, as in other cases. This is in virtue of the Act of Settlement of the Crown, 12 and 13 William III. cap. ii. By the Habeas Corpus Act the committal of any subject to prison out of the realm is made a *praemunire*, unpardonable even by the crown. Nor can the crown grant a pardon where private justice is chiefly concerned in the prosecution of offenders, or where an informer has, by the information he has brought, acquired a right to part of the penalty. Yet the crown has the right, in virtue of act 22 Vict. cap. xxxii. (1859), of remitting penalties even when payable to other parties than the crown. Sometimes the pardon is granted under conditions, as when the sentence of death is commuted to that of imprisonment for life. A court of law is not bound to take cognizance of a pardon granted by the crown unless it is pleaded by the recipient of the pardon, who may thus lose the benefit of it by his own negligence. In this respect a pardon granted by act of Parliament is more beneficial to the criminal, for the court is bound to take notice of it even though it is not pleaded by the criminal. A pardon, even after conviction of treason or felony, will enable a person to raise an action of slander against any one who calls him a traitor or felon. Pardon was formerly granted by the crown under the great seal, but by 7 and 8 Geo. IV. cap. xxviii. s. 13 it was made sufficient for the sovereign to issue a warrant for the purpose under his sign-manual, and countersigned by a secretary of state. In America the constitution provides that the president 'shall have power to grant reprieves and pardons for offences against the United States, except in cases of impeachment.' The Senate has the whole power of trying impeachments. It is presumed, therefore, that an act of Congress only can give the benefit of a pardon in cases of impeachments, if such power exists in any department of the government. By the same constitution 'judgment, in cases of impeachment, shall not extend further than to removal from office, and disqualification to hold and enjoy any office of honour, trust, or profit under the United States.' The party remains, nevertheless, liable to indictment and punishment for the offence by the common law tribunals, as in other cases. Similar provisions exist generally in the state constitutions, or state laws, throughout the Union. In German jurisprudence the word *abolition* is used to signify an act of mercy on the part of the sovereign, releasing some one from a deserved punishment without examination, or putting an end to a trial already commenced before a judgment, determining the guilt or innocence of the accused, has been pronounced. In several countries the prince has the right of stopping a process already commenced, for an uncertain time, and keeping it undecided, which is called *Sistirung*.

PARÉ, AMBROISE, the father of French surgery, was born early in the sixteenth century at Laval, and studied at Paris. In 1536 he attached himself as surgeon to the army destined to serve in Italy under Marshal René de Montejean, and in 1542 (having returned to Paris in 1539) accompanied the Viscount de Rohan during his campaign in Perpignan. In 1552 he became surgeon to Henry II., under whose successors (Francis II., Charles IX., and Henry III.) he held the same post. His ene-

mies were numerous among the physicians, who accused him of having poisoned Francis II.; but Paré, having cured Charles IX. of a dangerous wound, established himself so strongly in the favour of the court that Charles allowed him, though a Protestant, to escape the massacre of St. Bartholomew by taking refuge in his own apartments. He died at Paris in 1590. We are indebted to him for improvements in the treatment of gun-shot wounds and in the operation of trepanning. He also introduced or restored the practice of tying up divided arteries, operated on articular concretions, &c. His works appeared in French in 1575; in English in 1634.

PAREDES, Diego Garcia de, a celebrated warrior, sometimes called the Spanish Bayard, born of noble parents at Truxillo in Estremadura in 1466, accompanied his father in 1485 to the Moorish war in Granada, and was present at the taking of Baza, Velez, and Malaga. On the termination of the war by the downfall of Granada in 1492, he determined to repair to Italy to share in the exploits of the renowned Gonsalvo de Cordova; but on arriving at Rome was offered by the pope, the infamous Alexander VI., a high command in his army, which he accepted. After distinguishing himself in the Papal service he quitted it in 1499 for that of Gonsalvo, whom he accompanied in his expedition against the Turks. He was present at the taking of Cephalonia from the Turks in 1501. In the war for the possession of Naples which broke out between the Spaniards and French in 1502, he gave signal proofs of military skill and dauntless valour. At the celebrated passage of arms which took place at Trani he was one of the eleven Spanish champions, and though only recovering from wounds unseated three of his antagonists. At the siege of Ruvo in 1503 he led the forlorn hope, and was the first on the ramparts. At Cerignola in the same year he commanded the Spanish centre. He was rewarded for his services during the Italian campaigns with the estate of Colonetta, which was presented to him by Gonsalvo de Cordova. In 1515, on being deprived of his estates by their restoration to the Angevin lords, he is said to have maintained himself by privateering in the Levant. Such at least is Mariana's statement, though it seems scarcely consistent with the fact that he continued to serve in all the great wars of the time. He took part in the sieges of Verona and Vicenza, and was present in 1525 at the battle of Pavia. In 1530 he was present at the double coronation of Charles V. at Bologna, and died soon after in consequence of injuries sustained in falling from his horse. A short but interesting account of his campaigns and exploits, written by himself, is printed at the end of the Chronica del Gran Capitan (Alcalá, 1584).

PAREGORIC ELIXIR, a preparation of opium, which has different names in the pharmacopœias of different nations. It is quite a popular medicine, and is much used by nurses as a palliative in many of the lighter but more or less painful maladies of infants. As, however, there is some uncertainty about the effects of opium in all cases, and as there is much in the constitution of infants to increase this uncertainty, in the use of this and almost all medicines it is the safest course never to give paregoric, or any other preparation of opium, in their diseases, unless under the direction of a physician.

PARENT AND CHILD. The duty of maintaining and educating a child naturally falls upon the parent; and this precept of the law of nature is recognized and enforced among all nations. The laws of the Athenians enforced the duty of the parent towards the child so far as to prohibit the disinheritance of the child but for reasons to be approved by a magistrate; and the laws of some modern countries restrain the right of the parent in disposing of his property by will, or during his life, so as to defeat the inheritance of his children. The law of France, for example, allows a person who has children, grandchildren, or remoter offspring, to dispose, either by gift or bequest, of only a certain proportion of his property, which varies according to the number of legitimate children which survive to him at the time the gift or bequest is made, or the number which the remoter descendants represent, the descendants of one child being counted only as one. If he has only one child he may dispose of half his property; if he has two, of one-third; if he has three or more, of one-fourth. All that he has not so disposed of is at his death divided equally between the surviving children and the families of children who do not survive. A similar law limits the testamentary rights of a person, and regulates the succession to his estate in the case of his leaving parents or grandparents to survive him, but no descendants. By Scotch law, when one person succeeds to another, and the latter leaves children behind him who are unable to provide for themselves, the former must allow aliment to the sons until they attain their majority, and to the daughters until they are married. The laws of England, and those of the United States (whose code is founded upon the common law of England), only require the parents to maintain the child during his minority, or until he arrives at the age of twenty-one years, or such other age as is fixed upon as that of majority, unless afterwards the child is unable to maintain himself, in which case the laws more generally, if not universally, in civilized states, impose upon the parents, or other relatives, the duty of maintaining him; and so, *vice versâ*, in case of the parents being unable to maintain themselves, the law imposes the duty upon the children. This law, enjoining the duty of maintenance reciprocally between parents and children, and extending it in certain cases to other relatives, is founded partly on the motive of exonerating the public from this charge. The father has the right of custody and control of his children, and is entitled to their service and obedience, unless he is insane, or, by some act or circumstance specified by the laws, forfeits or is deprived of these rights; for the child, though to many purposes under the dominion of the father until the age of majority, is not absolutely so; on the contrary, the law recognizes the existence of the child, and extends protection to it, not only from the time of the birth, but even before; for a child may inherit an estate that descends during the time of the mother's gestation. During the lifetime of the father the mother has, by the law of England, no legal power over her child, except as provided for by 36 and 37 Vict. cap. xii., which empowers the court of chancery to order that a mother may have access to, or, if the court deem proper, may have the custody of, any of her children under sixteen years of age, or, if they are already in her custody, that they shall continue so up to that age, subject to the regulations which the court may fix for the access of the father or guardians. The divorce court may make such regulations as it may think fit as to the custody, maintenance, and education of the children of parties to a suit for judicial separation, nullity of marriage, or dissolution of marriage. In case of the gross abuse of the parental authority, or egregious disqualification of the parent for the office of guardian, the law extends its protection to the child by the appointment of another guardian. All systems of laws do not agree as to what circumstances give proper occasion for the substitution of another guardian in the place of the parent. The insanity or

idiocy of the parent, which divests him of all moral or legal capacity or responsibility, will of course, under all laws, exempt the child from all duty of obedience. The laws also usually make provision for cases of abuse and extreme cruelty on the part of the parent. In case of the decease of the father the law transfers his authority over his children to the mother. The laws relating to the mutual rights and duties of parents and children are obviously a very important part of every code, and have a very intimate connection with the state of society, and with civil institutions. The welfare of the community is, for instance, directly and deeply affected by the education of youth, and one object of every code is to encourage such a course of education as may form good citizens. Solon provided, for this purpose, that a child not educated by the parent to some art or trade should not be obliged to support the parent in old age. In England the education of children by parents has not yet been made a legal duty, but according to the law of Scotland a father is bound to support, clothe, and educate his children according to their rank and station in life; and these duties may be judicially enforced. The Elementary Edution Acts for England (1870) and Scotland (1872) also empower school-boards to impose upon parents within the district for which they are elected the duty of educating their children, and to require the performance of this duty. In ancient times, when paternity was a great foundation of civil authority, the parental rights were much more absolute than in the modern, extending in some countries to the right of life and death, and continuing during the life of the two parties. The Persians, Egyptians, Greeks, Gauls, and Romans allowed to fathers a very absolute dominion over their children. Among the Romans the right of a father over his child at first amounted almost to an absolute power of life and death; but this right was gradually softened by the progress of refinement. In the time of Constantine the putting to death an adult child by the parent was made a capital crime. No such power is permitted among modern civilized nations, as we have already seen; but provisions are made by law to prevent and punish cruelty on the part of the parent. But the law everywhere allows the parent to inflict moderate chastisement on a child—a liberty which must be given, in order to secure authority on one side and obedience on the other.

PARENTHESIS, a Greek term nearly equivalent to *interposition*, denotes a clause which, though not necessary to complete the sentence, is inserted into the body of it, often in its middle, though it may also be towards its end, for the purpose of modifying or explaining it. Among the ancient rhetoricians parentheses were often employed as figures of speech, frequently with the view of heightening the effect of the oratory by interrupting the monotony of a continuous unbroken sentence. In writing or printing particular well-known signs are used to express the place where the parenthesis begins and ends.

PARGA, a fortified seaport in European Turkey, Albania, 47 miles S.W. Janina, on a rocky peninsula which separates two small bays, and is so steep that the houses almost appear to be constructed one above another. A strong, though small, acropolis defends the town, and the harbour is protected by a small fortified island. From 1401 to 1797 Parga was under the protection of Venice. In the latter year, on the fall of that republic, it came under French dominion, and after being successively occupied by Russians, French, and English, it was at last delivered up to the Turks in May, 1819, when its original inhabitants emigrated to the Ionian Islands. Pop. 4000.

PARIA, GULF OF, a magnificent inlet of the Atlantic, on the coast of South America, between the Island of Trinidad and mainland of Venezuela; lat. 10° 30′ N.; lon. 62° W.; 95 miles long by about 35 miles broad. It communicates with the ocean by two channels; the north, called the Dragon's Mouth, 12 miles wide, and divided by three islands into four passages; and the south, called the Serpent's Mouth, about 10 miles wide. From both channels a current perpetually flows out. The gulf possesses good anchorage, receives several rivers, including some arms of the Orinoco, and abounds in fish. It was discovered by Columbus in his fourth voyage, in 1508.

PARIAN CHRONICLE. See ARUNDELIAN MARBLES.

PARIAS, Hindus of the impure castes of the Sutas, Vaidehas, and Chandalas, so numerous a class that Manu, in his tenth chapter, has not even taken the trouble to enumerate them. The Sudras, the fourth, or lowest caste of Brahmanical Hindus, is widely separated from the three privileged ones; but still further removed and more degraded are the mixed and impure classes, the number of which, according to some, amounts to eighty-four. The three castes above named are the only ones called *Parias* in the code of Manu (x. 26); they are prohibited from all approach to anything pure, as if they were infected with leprosy. Many authorities think that the difference of colour between these Parias and the higher classes shows them to have been the original inhabitants of the country, who were deprived of all rights for defending their independence. They are described by various writers as having sunk to so degraded a condition that it is not possible to conceive of human beings descending lower.

PARING and BURNING, a mode of reclaiming waste lands, sometimes also resorted to for fertilizing exhausted soils. It consists in paring off the surface in thin slices, which, after being allowed to dry, are burned. Being a ready means of destroying the natural over-growth of lands that were to be broken up, and the cumbrous weeds of arable lands that were imperfectly tilled, it became an essential feature of early agriculture; but in these days of green crops, deep pulverizing, and sewage irrigation, it must be regarded as a practice pertaining to the improvement of waste lands and the conversion of pasture into tillage, rather than as one of the essential points of ordinary farm management. The mere convenience of this mode of breaking up sward land is not, however, its chief merit; soil pared and burned has been found to yield a succession of crops without manuring under such conditions as prove the fertilizing effect of this treatment. Its best results have been upon clays, marls, and other cohesive soils, and upon peaty grounds having an excess of vegetable matter. On the latter, however, it is frequently carried too far; and because of the ease with which the inflammable turf yields to combustion, too much of the soil is allowed to be consumed. The best method of performing the operation of paring is by means of a plough specially devised for the purpose, in which broad angular shares with wings facing each other, are fixed upon curved uprights so as to set two furrow-slices up on edge with their grass surfaces close together. It is usual to begin paring early in spring, and two or three weeks after the turf, unless the season is a wet one, being then sufficiently dried, is put into small heaps for burning, the sods being loosely packed in the centre, but closely set together on the outside. The art in burning is to keep a smouldering fire, never smothering it with too much earth, and keeping the outside layer of sods so close as to prevent the fire from

kindling into flame. The ashes should be spread, and time having been allowed for their cooling, should then be ploughed in with a very shallow furrow to keep them near to the surface.

PARINI, GIUSEPPE, one of the most celebrated Italian poets of modern times, was born at Bosisio, a village of the Milanese, in 1729, studied polite literature and science at Milan, and devoted himself, in compliance with the wishes of his father, but contrary to his own inclination, to theology. In spite of narrow circumstances and a feeble constitution he laboured assiduously in his studies, and early made some essays in poetry. To relieve his wants he published a collection of these youthful productions, under the name of Ripano Eupilino, in 1752. It was successful, and he was admitted a member of the Academy of the Arcadians at Rome. Having been appointed preceptor in the Borromeo and Serbelloni families, he was now enabled to apply himself more exclusively to his favourite studies. His familiarity with the manners of the great led him to attempt a delineation of them in a species of didactic and dramatic satire, entitled Il Giorno (The Day). The Mattino (Morning) appeared in 1763, and the Mezzogiorno (Noon) two years later. This poem obtained for him the professorship of rhetoric in the gymnasium of the Brera. The Giorno, often interrupted by the troubled state of Italy, was finally completed under the title of Il Vespero (Evening) and La Notte (Night). He died in 1799. His works have been published in six volumes (1801–4).

PARIS (anciently, *Lutetia Parisiorum*), the capital of France, and, after London, the largest and most populous city in Europe; lat. (observatory), 48° 50′ 13″ N.; and lon. 2° 20′ 23″ E.; 212 miles S.S.E. of London; on both sides and on two islands of the Seine, 111 miles from its mouth. It is surrounded with fortifications, consisting of a wall 33 feet in height, bastioned and terraced, lined with a fosse about 20 feet deep, and embracing both banks of the Seine, with a continuous inclosure, and of outworks composed of sixteen detached forts. These fortifications were erected in the reign of Louis Philippe, at a cost of upwards of £20,000,000 sterling, and take in much of the suburbs, and even of the surrounding country. As in the Franco-German war of 1870–71 these fortifications proved insufficient, the question of increasing them by the addition of new forts at a still greater distance from the city than those already existing began to be discussed as soon as peace was restored; and it was determined by the National Assembly in the session of 1874 to erect a new outer circle of fortifications. These consist of seven forts of the first and eleven of the second class together with 27 redoubts and batteries, which defend an encircling line of 77 miles long, and from 21 to 28 miles in diameter; the area thus inclosed measuring about 430 square miles. Within the wall of the fortifications there was formerly another wall which formed the boundary of the city proper, and was called the *mur d'octroi*, because the *octroi* or duties on goods brought into the city were levied at it; but in 1860 this inner wall was demolished, the districts between it and the outer wall having been annexed to the city. The area of Paris within the outer wall is 19,274 acres, or a little more than 30 square miles.

The Seine traverses the city in a W.N.W. direction, and has a breadth varying from 450 feet above the Pont d'Iéna to 1060 feet below the Pont Neuf. Its average breadth is considerably less than that of the Thames at London. It is shallow and navigable only by barges and small steamers. About the middle of the city it forms two (originally three) islands, the westernmost of which is called Ile de la Cité, and contained the first nucleus of the city of Paris. The quays of the Seine are built of solid masonry, and form large terraces, with a roadway in the centre, and a footpath on either side, generally bordered with trees. They extend about 11 miles, and in addition to the splendid walks which they afford, serve the important purpose of protecting the lower parts of the city from inundations, from which, previously to these erections, it often suffered. The most considerable inundations in this century were those of 1802, 1836, and 1844. The number of bridges is twenty-seven. The most deserving of notice are the Pont de l'Alma, completed on the 2d of April, 1856, a beautiful structure consisting of three stone arches, the middle one of which has a span of 141 feet, being the largest stone arch in Paris; the Pont Neuf, an ancient bridge, the longest of all, centrally situated, forming one of the principal thoroughfares, and connecting the Ile de la Cité with both banks of the river; the Pont des Arts, a light and elegant iron bridge of nine arches, resting on stone piers; the Pont de la Concorde, or Pont de Louis XVI., built with the stones which formed the Bastille, and once adorned with colossal statues of white marble; and the Pont d'Iéna, a remarkably handsome structure, consisting of five elliptical arches, and decorated with a cornice imitated from the temple of Mars at Rome, and garlands of oak and laurel; and the Pont-viaduc du Point-du-Jour, a high and low level bridge at the south-western extremity of the city, the upper of which is for the railway which passes round Paris on the inner side of the fortifications (*chemin de fer de ceinture*), and is continuous with a viaduct on either bank of the river, and the lower of which is for carriages and foot passengers.

The houses are almost all built of white calcareous stone. Their general height is from five to six stories, arranged as distinct tenements, and reached by common stairs, as is still usual in the cities and large towns of Scotland. Very frequently, however, the stair is not entered immediately from the street, but is preceded by a *porte cochère* or carriage entrance leading into a court round the sides of which the houses rise in lofty piles. Such private streets are called *cités*. The more aristocratic mansions are, of course, separate tenements.

The climate of Paris is temperate and agreeable, being neither liable to the extremes to which places at a great distance from the sea are subject, nor so humid as places situated too near the sea. The mean annual temperature is 51·5° Fahr., the mean winter temperature 38°; spring, 50·5°; summer, 64·5°; and autumn, 52°.

Boulevards, Avenues, Streets, and Squares.—The boulevards (which see) include the interior, exterior, and military. The most frequented and famous of the boulevards is that which, under various names for its different sections forms an irregular arc on the right side of the Seine, extending from the Place de la Bastille on the east, to the Place de la Madeleine on the west, and is specially called *The Boulevard*. It is the centre of Parisian gaiety, and a type of Paris itself. Beginning with the Place de la Bastille, the first part of this boulevard is comparatively deserted. The movement begins with the part called the Boulevard du Temple. The Boulevard St. Denis is the part where the movement is greatest, owing to the fact that some of the main business streets in Paris open into it. Further west is the Boulevard de Montmartre, which is remarkable for the magnificence of its cafés, shops, and private houses. The Boulevard des Italiens, which takes its name from the Italian Theatre in it, is a continuation of this section, and is the favourite rendezvous

of the young fashionables of Paris. The interior boulevards on the left bank of the Seine cannot in any respect be compared to those of the right. The exterior boulevards are so called because they are outside of the old *mur d'octroi*. They are splendid promenades of great width. The military road which passes round the interior of the fortifications is divided into boulevards which are named after the generals of the first empire. The name of avenues is not used in any fixed sense in Paris, being sometimes applied to ordinary streets and sometimes to such as are usually called boulevards. The most celebrated boulevard avenues are the twelve wide thoroughfares which radiate from the Place de l'Étoile in the west of the city. The streets in several of the newer parts of the town are straight, wide, airy, and excellently paved, both in the centre for carriages, and on the sides for foot passengers; but, as a general rule, the older streets are irregular in the extreme, cutting each other, not in parallel lines, but at all kinds of angles; and many of them, even in leading thoroughfares, so narrow, that carriages have difficulty in passing, and persons on foot often run considerable risk of bodily injury. The best streets after the inner boulevards, which have been already mentioned, are the Rue de Rivoli, a straight line connecting the Place de la Bastille with the Place de la Concorde, which lies a little to the south of the Place de la Madeleine, with which it is connected by the Rue Royale; the Rue Castiglione, and Rue de la Paix, which are in a line with one another, although separated by the Place Vendôme; the Rue de la Chaussée d'Antin, and the Rue des Pyramides, all in the same quarter of the town, namely, the district about the west end of the Rue de Rivoli, and the line of boulevards above described. Of the *places* of Paris, by far the finest, both from its position and its buildings and monuments, is the Place de la Concorde. It is situated between the gardens of the Tuileries on the east, and the still larger, if not finer expanse of the Champs Élysées on the west; and is adorned with various monuments, of which the most conspicuous is an obelisk transported from Luxor in Egypt. The only other *places* deserving of notice are the Place Vendôme, an irregular octagon, surrounded by edifices of uniform appearance, the centre occupied by a lofty column modelled on that of Trajan at Rome, and covered with bass-reliefs cast from 1200 pieces of cannon taken in war; the Place de la Bastille, occupying the site of the notorious prison of that name; the Place du Chatelet, with a fountain in its centre, consisting of a circular basin 20 feet in diameter, with a column 58 feet high, divided by bands of bronze gilt, inscribed with Napoleon's principal victories; the Place d'Étoile, already mentioned, in the centre of which is the *arc de triomphe* dedicated to the glory of the French armies; and the Place du Carrousel, between the Tuileries and the Louvre, containing a magnificent triumphal arch 45 feet high by 60 feet long and 20 feet broad, designed after the arch of Septimius Severus at Rome. During the rising of the Communists in 1871 the column in the Place Vendôme was overthrown, but it has since been re-erected. Besides the old *places* modern Paris has a number of squares in the English style, except that the gardens belonging to them are in every case public. The *passages* or arcades in Paris are numerous. The principal are the Passage Vivienne, Passage Colbert, Passage Choiseul, Passage des Panorames (the largest of all), and Passage du Caire.

Churches.—Of these the most celebrated is the Cathedral of Notre Dame, situated on one of the islands of the Seine, called the Île de la Cité. It is a vast cruciform structure, with a lofty west front, flanked by two square towers, and with a beautiful spire, rising from the intersection of the nave and transept. Three ample portals lead into the interior, which consists of a nave with double aisles and transepts, and terminates in an octagon. The whole length of the church is 462 feet, its breadth 157 feet, height of towers 220 feet, height of interior 111 feet. The whole building, with exception of some comparatively modern alterations, is in an early and pure style of pointed architecture, sufficiently provided but by no means overloaded with ornaments, remarkable for their high degree of finish and delicacy. The foundation of Notre Dame belongs to the sixth century, but the present edifice only dates from 1163, when it was begun by Maurice de Sully, sixty-second bishop of Paris. The nave and the west portal belong to the early years of the thirteenth century, and the transept and north and south portals to a later period of the same century. The only one of the architects whose name has been preserved is Jean Chelles. The church of La Madeleine is a modern structure of singular magnificence. It stands on an elevated platform fronting the north end of the Rue Royale, and is surrounded by a colonnade of fifty-two isolated Corinthian pillars. The interior consists of a vast unbroken nave, lined with rich marbles, and lighted from above by four circular apertures in a richly gilded ceiling, supported by majestic Corinthian columns. The edifice is surpassingly gorgeous, but has none of the solemn majesty which should characterize a church. The church of St. Geneviève, built about the close of last century, was after its completion set apart as a French Westminster Abbey, under the title of the Panthéon (which see). The other churches most deserving of notice are those of St. Eustache, after Notre Dame the largest church in Paris, and recently restored with great splendour; St. Germain l'Auxerrois, from the belfry of which the signal for the massacre of St. Bartholomew was tolled; St. Gervais, with a chapel regarded as the most beautiful in Paris; Notre Dame de Lorette, a beautiful modern church of small dimensions; St. Paul and St. Louis, with a magnificent front, fine colonnade, and a lofty dome; St. Pierre du Gros Caillou; St. Roch, the burial-place of Corneille, and the church of the court during the time of Louis Philippe; Du Val de Grace, less remarkable for external than for internal beauty, with a dome, heavy without, but so finely painted within as to be considered one of the finest frescoes in France; St. Vincent de Paul, a splendid modern church, finely situated on an eminence; the church of the Sorbonne, so called from having belonged to the celebrated school of that name, containing the finely-sculptured tomb of the Cardinal de Richelieu; and St. Sulpice, a handsome edifice, commenced in the seventeenth, but not finished till the middle of the eighteenth century. The Protestants have several churches, of which the principal are those of the Oratoire and Visitation, formerly belonging to the Roman Catholics, but both ceded by government to the French Calvinists. There are also four English Episcopal chapels, besides other chapels belonging to other English, Scotch, and American denominations; a Greek chapel, which the members of the Russian embassy attend; and two synagogues; an Armenian chapel, a small Mohammedan mosque, and a Jewish synagogue.

Palaces.—The principal palaces of Paris are the Louvre, the Luxembourg, the Palais Royal, and the Élysée. The oldest part of the Louvre dates from the time of Francis I. (first part of sixteenth century); but the palace was not finished till the reign of Louis XIV., who built the elegant eastern façade. It is now used as a general museum to receive the collections of the nation in science and

art. In May, 1871, the whole building was seriously imperilled by the incendiarism of the Communists; the part of the connecting wing next to the old palace of the Tuileries was much damaged by the fire, and the imperial library of 90,000 vols. and many valuable MSS. was entirely destroyed before the arrival of the military, who arrested the progress of the flames. The palace of the Tuileries, which was first set on fire, was reduced to a gigantic heap of ruins, and remained in that condition until 1883, when it was entirely removed. The Palais du Luxembourg on the south side of the river is a very magnificent one, and has very extensive gardens attached to it. It was built for Marie de Médicis, widow of Henry IV., in imitation of the Pitti Palace at Florence, between 1616 and 1620. The Palais Royal is on the north side of the river, in the Rue St. Honoré, a little to the north of the building connecting the Tuileries with the Louvre. It was founded by Cardinal Richelieu in 1629, and was originally named Palais Cardinal. It received its present name on being presented to Louis XIII. in 1642. (For further details concerning these four palaces, see the articles LOUVRE, LUXEMBOURG (Palace of), PALAIS ROYAL, and TUILERIES.) The Palais de l'Élysée, situated in the Rue St. Honoré, with a garden extending south to the Champs Élysées, which lie immediately to the west of the Place de la Concorde, was built by the Comte d'Evreux in the early part of last century, after the designs of Molet. It next passed into the hands of Madame de Pompadour, whose brother, the Marquis de Marigny, sold it to Louis XV. In 1773 it was acquired by the financier Beaujon, who had it embellished by Boullée. In 1786 it passed to the Duchesse de Bourbon, and in 1793 became national property. It was afterwards occupied successively by Murat, the Emperor Napoleon I., the Duchess de Berry, and Louis Napoleon, as president of the republic. When Louis Napoleon became emperor he enlarged and restored this palace in a magnificent manner, and during his reign it was used on several occasions as the residence of foreign sovereigns visiting Paris. It is now the residence of the president of the republic.

Government and Municipal Buildings.—The Palais du Corps Législatif, or Chambre des Députés, is the building in which the corps législatif held their meetings under the first and second empires, and since 1879 the republican chamber of deputies. It occupies part of the site of the Palais Bourbon, begun in 1722 by the Duchess-dowager of Bourbon. The present hall, with library attached to it, was built between 1828 and 1832. Its north or principal front is adorned by a portico of twelve Corinthian columns, supporting a pediment with an allegorical bass-relief, and is approached by a flight of twenty steps. Immediately behind is the chamber itself, a semicircular hall, ornamented with twenty Ionic columns of white marble, the wall being hung with Gobelins tapestry representing Raphael's School of Athens. The Hôtel de Ville, situated in the Place de Grève, on the right bank of the river, opposite the east end of the Île de la Cité, the seat of the municipal and departmental administration, was destroyed by the Communists in 1871. It was built in the form of an oblong rectangle. The central part, fronting the Place de Grève, was of the style of the sixteenth century, all the others in the most elegant style of the Italian renaissance. More than 150 statues adorned the different sides of the edifice. Most of these were the statues of men who had done honour to Paris in literature, science, art, or government, the rest were allegorical figures. Some of the most valuable of these statues, as well as some of the finest objects of art which adorned the interior, were saved from destruction, and will adorn the new building which is being erected on the site on a plan very similar to that of the last. The Admiralty (Hôtel de la Marine), on the north side of the Place de la Concorde, is a beautiful structure; which, under its original name of Garde-Meuble de la Couronne, was the place where the crown-jewels were kept and previous to the revolution contained an immense number of valuable and curious objects. The Palais de Justice is an irregular mass of buildings erected at different periods during the last five centuries, and occupying the greater part of the western extremity of the Île de la Cité. It also suffered greatly from the destructive fury of the Communists in 1881, and has not yet been completely restored. Opposite the Palais de Justice is the Tribunal de Commerce, a quadrangular building inclosing a large court roofed with glass. The Mint (Hôtel des Monnaies) fronts the Quai Conti, on the south side of the Seine, and contains an immense collection of coins and medals; the ground-plan includes eight courts, with ranges of buildings in which all the operations connected with coining are carried on. The building is a fine specimen of architecture. It was begun in 1771, after the designs of J. D. Antoine. The Post-office (Hôtel des Postes), to the east of the Palais Royal, in an old quarter now undergoing considerable transformation, is being reconstructed. The Exchange (La Bourse), in the Rue Vivienne, is a beautiful modern structure, completed in 1826; it is in the form of a parallelogram, 212 feet by 126 feet, surrounded by a range of sixty-six columns, supporting an entablature and masked attic, and forming a covered gallery, which is approached by a flight of steps extending along the whole of the west front. The Salle de la Bourse, where business is transacted, is a large apartment, of the Doric order, surrounded by a series of 66 Corinthian columns. The deeply-coved ceiling is divided into sixteen compartments, covered with fine monochrome drawings, which have the effect of bass-reliefs. The other principal government buildings are the Treasury (Hôtel des Finances), in the Rue de Rivoli; the Record Office (Hôtel des Archives Nationales), in the Hôtel Soubise, Vieille du Temple; and the national printing-office, in the adjoining Hôtel Roban-Soubise. There are numerous markets, the principal of which are the Halles Centrales, in the centre of the town; the Halle aux Vins, which is properly an entrepôt for liquors of all kinds, in the south-east; and the Marché aux Bestiaux, on the Canal de l'Ourcq, in the extreme north-east, opposite which, on the other side of the canal, are the largest slaughter-houses (abattoirs) in Paris, erected between 1865 and 1867. The principal military barrack in Paris is the École Militaire, on the south side of the river and in the west of the city, forming the south-east boundary of the great military parade-ground called the Champ-de-Mars (which see).

Museums.—At the head of the museums stands the magnificent collection of the Louvre (which see). It consists of the following fourteen collections:—1. The Gallery of paintings, containing, besides about 700 pictures of the French School, numerous specimens of the Italian, Flemish, and Dutch schools, a few of the Spanish and German schools, and (since 1873) some of the English school. Though justly deprived of many of the master-pieces which had been brought to it from all parts of Europe by a system of wholesale spoliation, it is still one of the finest galleries in existence. 2. The Gallery of Drawings, containing no less than 35,544 pieces. 3. The Gallery of Engravings. 4. The Gallery of Ancient Sculptures, the pride of which is the Venus of Milo, discovered in 1820, and presented to the

museum by M. de Rivière, then the French ambassador at Constantinople. 5. The Gallery of Antique Bronzes. 6. The Gallery of Sculptures of the Middle Ages and the Renaissance. 7. The Gallery of Modern Sculpture. 8. The Gallery of the Middle Ages and the Renaissance, containing specimens of designs in metals, jewelry, and enamelling. 9. The Assyrian Gallery, formed of the discoveries of the French consuls (M. Botta and others) at Nineveh and Mosul. 10. The Egyptian Museum, enriched with the fruits of the French researches in Egypt, and, in regard to all that relates to domestic life in its minuter details, not surpassed by any other collection. 11. The collection of Greek, Etruscan, and Roman antiquities, which is particularly rich in Greek and Etruscan vases, and in articles obtained from Herculaneum and Pompeii. The most precious treasures of this collection are a metope and part of the frieze of the Parthenon sculptured by Phidias. 12. The American Museum, containing Peruvian and Mexican antiquities. 13. The Naval Museum (Musée de Marine), containing beautiful models of vessels of all classes, both finished and in every stage of construction; models, also, of the principal naval ports of France. 14. The ethnographical collection, which is intended to give an idea of the industries, customs, and modes of dress of the different races of the earth. There was formerly a fifteenth collection, called the Musée des Souverains, which was formed by Napoleon III. in 1852, but was done away with after the revolution of the 4th of September. It contained various objects that had belonged to former sovereigns. Its contents have been distributed over the various national museums. Besides the museums of the Louvre there are the Musée du Luxembourg, in the palace of that name, appropriated to the finest works of living French artists, purchased by government; the Musée d'Artillerie, containing suits of ancient armour, arms, instruments, machines, and models of those used by the artillery service; the Conservatoire des Arts et Métiers, occupying the very extensive buildings which formerly belonged to the Abbey of St. Martin des Champs, and containing a most valuable and interesting collection of machines, models, drawings, &c., relating to almost all branches of industry.

Libraries.—The most important library is the Bibliothèque Nationale, occupying a vast building almost devoid of ornament, but containing one of the largest and most valuable collections in existence. It is impossible to give even an approximation to the true number of printed volumes, pamphlets, &c., contained in this library, for the estimates vary from 900,000 to 2,000,000, and there is similar diversity in the estimates of all the other departments, those of manuscript volumes, historical documents, &c., of maps, plans, and charts, of engravings, and of antiquities. The antiquities consist chiefly of coins and medals, many of them rare and some unique. The other more important libraries are those of the Arsenal, supposed to contain 200,000 volumes and 6000 MSS.; St. Geneviève, 120,000 volumes (40,000 of which are theological, forming the largest and choicest collection existing in that department of speculation) and 2400 MSS.; Mazarin, at the Institute, 150,000 volumes and 3700 MSS.; De la Ville, 100,000 volumes; De l'Institut, 100,000 volumes; De l'Université, 140,000 volumes; Du Conseil d'État, 36,000 volumes; De la Faculté de Médecine, 30,000 volumes; Du Musée d'Histoire Naturelle, 30,000 volumes; and libraries of greater or less extent are attached to almost all the public institutions, governmental, judicial, and municipal offices. See also the section on Learned Societies and Scientific Establishments.

Educational Establishments.—The University of Paris, founded in the thirteenth century, and long one of the most celebrated in Europe, was suppressed at the revolution, and an entirely new system of public education adopted. (See FRANCE—Instruction and Public Worship.) The higher education of Paris is in the hands of the faculties of theology, literature, science, law, and medicine, the first three of which are established at the Sorbonne (which see), that of law in a special building in the Place du Panthéon, and that of medicine in the École de Médecine. There are, besides, thirty courses of lectures in the various departments of science, philology, and philosophy, delivered in the Collége de France; courses of chemistry, natural history, &c., in the museum of the Jardin des Plantes; and a course of astronomy at the observatory. Among the Parisian schools and lycées the most important are Descartes (formerly Louis le Grand), St. Louis, Corneille (formerly Collége Henri IV.), Charlemagne, Fontanes (formerly Condorcet), De Vanves, the Lycées, the École Polytechnique (which see); Conservatoire des Arts et Métiers (see CONSERVATORY), giving a complete system of technical instruction; the École Centrale des Arts et Manufactures, for the education of engineers, directors of manufactories, builders, &c.; the École Normale (which see), for training professors of a higher grade, and several École Normales Élémentaires, for ordinary male and female teachers; École des Ponts et Chaussées, consisting of about 100 pupils, taken from the École Polytechnique, to be instructed in all the branches of civil engineering; École des Mines, for the study of mining and its kindred sciences; École Turgot and École Colbert, both industrial schools; École des Chartes, in which palæography, or the art of deciphering and studying ancient MSS., is taught; École des Langues Orientales (founded in 1795); Séminaire du Saint-Esprit and Séminaire de Saint-Sulpice, two theological schools, and Séminaire des Missions Étrangères, for the training of missionaries for the far East; École de Pharmacie, the sole power of licensing apothecaries, who cannot practise till examined here; École Pratique d'Anatomie; École d'Application, for the training of military surgeons and pharmacists; École Gratuite de Dessin, de Mathematique, et de Sculpture d'Ornement, a kind of mechanics' institute; École Spéciale et Gratuite de Dessin pour les Jeunes Personnes, in which young women intended for the arts or similar professions have the means of studying figures, landscapes, flowers, &c.; Palais and École des Beaux Arts (which see), in which gratuitous lectures on all subjects connected with the arts are given by twenty-one professors; École d'Architecture (founded in 1865); Conservatoire de Musique et de Déclamation, for the instruction of both sexes in music, singing, &c., by a numerous body of the first professors, male and female; and numerous primary schools, superior and infant schools, &c.

Benevolent Institutions.—The benevolent institutions of Paris are partly supported and managed by the state, and partly by private bodies. The former are placed under the administration of the prefect of the Seine and the minister of the interior, who have the direction of general and special hospitals, alms-houses, and other establishments for giving either permanent support or temporary relief. The revenue is derived from a funded capital, from a poor-rate, from cafés-concerts, from a subvention voted by the city of Paris, and other sources. The yearly receipts from private sources average £350,000, and the total annual expenditure to £500,000; the deficit being made up from municipal funds. There are sixteen hospitals in Paris, with accommodation for about 6500 patients, devoted to the gratu-

itous treatment of the indigent sick and injured. Eight of these are general hospitals, and seven are intended for the reception of those afflicted with special diseases. The general hospitals are the Hôtel Dieu, the most ancient of all the Parisian hospitals (having been originally founded in 660 under Clovis II.), situated on the Île de la Cité, and forming a very extensive and admirably managed infirmary, which has in all over 800 beds, and on an average annually receives about 11,000 patients (see HOSPITAL); Hôpital de la Pitié, Hôpital de la Charité, and the Hôpitaux Saint-Antoine, Necker, Cochin, Beaujon, and Lariboisière. The special hospitals are St. Louis, for cutaneous diseases; Hôpital du Midi and Hôpital de Lourcine, both for syphilitic complaints, Hôpital de la Maternité, Hôpital des Enfants Malades, Hôpital Sainte-Eugénie, also for the diseases of children; and Hôpital des Cliniques, for surgical cases and accouchements. There are four large hospices or alms-houses in Paris under public management—the Bicêtre, for old men; the Salpétrière, for old women; the Hospice des Incurables, for both men and women; and the Hospice des Enfants Assistés. Lunatics are admitted into the Bicêtre and the Salpétrière; but there is a special asylum for lunatics called L'Asile Sainte-Anne, founded in 1864. In addition to the above classified hospitals are numerous establishments of a benevolent nature, well deserving of notice. The most celebrated of these is the Hôtel des Invalides, or asylum for old soldiers, a magnificent establishment originally intended to accommodate 5000 inmates; there are now, however, only about 450, and the number is steadily decreasing, as mostly of the invalides prefer to live independently on their pensions. Several parts of the building have accordingly been adapted for other purposes; the greater part of the west wing being, for instance, occupied by the Museum of Artillery. Under the dome is the celebrated tomb of Napoleon I. (See INVALIDES, HÔTEL DES.) Among other benevolent institutions are the lunatic asylum (Maison des Aliénés, Charenton), two blind asylums, the deaf and dumb institute (Institution des Sourds-Muets); two hospitals at Vincennes for wounded and convalescent artisans, one for men and one for women, all under the administration of the minister of the interior; besides a great variety of societies, both public and private, for distributing food and clothing, and reclaiming those who have gone astray. Among the private benevolent establishments the most remarkable are the *crèches*, in which infants belonging to poor people are received for the day at a small charge; and the *ouvroirs*, in which aged people are supplied with such work as they are fitted for, and children are taught some trade or industrial occupation.

Prisons and Correctional Establishments.—The Prison du Dépôt receives all persons arrested before they are examined. The Prison Mazas receives accused persons while undergoing their preliminary examination. The Prison de la Conciergerie, in the Palais de Justice, is for the reception of accused persons about to be tried and during their trial. Those who are condemned to death or forced labour (*travail forcé*) are confined in the Dépôt des Condamnés previously to their execution or departure for the scene of their labour. It is situated in the Rue de la Roquette, in the east of the city; and opposite is the Prison des Jeunes Détenus, in which young persons are confined. Besides these there are the Prison des Madelonettes; Prison de la Santé; and Prison de Sainte-Pélagie, for men; the Prison de Saint-Lazare, for women; and the Prison du Cherche-Midi, for military criminals. The Prison de Sainte-Pélagie has a section set apart for political offenders. The principal correctional establishment in the city is the Maison Centrale d'éducation correctionelle. Of Paris prisons no longer existing that of La Force, demolished in 1850, is memorable as the scene of the notorious atrocities of the *Septembriseurs* in 1792.

Places of Resort and Amusement.—Of the former several have already been incidentally mentioned, but there are still some which require notice. Among these is the most celebrated of all, the Champs Élysées. It stretches west from the Place de la Concorde to the Arc de Triomphe de l'Étoile for about 1¼ mile. It consists of a central road lined with trees, and bordered for nearly half its length with wide walks and open spaces on each side, crowded, particularly on holidays, with all grades of Parisian society, and presenting one of the gayest and liveliest scenes which can well be imagined. The public fêtes all take place here, and even on the most ordinary occasions all kinds of attractions are to be found in the shape of shows, musical bands, panoramas, circuses, &c. There are also three public parks within the boundaries of the city, namely, Monceaux, in the north-west; Buttes-Chaumont, in the east; and Montsouris, in the south, besides two which, though beyond the fortifications, must yet be named here on account of their intimate connection with Parisian life—the Bois de Boulogne (which see), on the west of the city, and the Bois de Vincennes, on the south-east. The theatres of Paris and its immediate suburbs afford accommodation for 30,000 persons. The most important are the Opera House, a gorgeous edifice of great size, in the Boulevard des Capucines, inaugurated on the 5th of January, 1875; the Opéra Comique, the Théâtre Français, the Odéon; the Théâtre de la Gaîté, for vaudevilles and melodramas; Théâtre des Folies Dramatiques, Théâtre du Vaudeville, Théâtre des Variétés, Théâtre du Palais Royal, Théâtre de la Porte St. Martin, Théâtre de l'Ambigu Comique, and the Théâtre des Folies Marigny, in the Champs Élysées. Numerous other places of amusement are always open, many of a more rational, but not a few also of a questionable kind. A place of resort, though certainly not of amusement, furnishing one of the most interesting and impressive sights of the capital, is the celebrated cemetery of Père-la-Chaise.

Learned Societies and Scientific Establishments.—At the head of these stands the Institut de France, which has acquired such celebrity that the most distinguished European philosophers covet the honour of being admitted to it as foreign associates. (See INSTITUTE OF FRANCE.) The Institute overshadows most of the other societies, many of which, however, have distinguished themselves, and are well known under the names of the Antiquarian, Philomathic, Natural History, Geographical, Statistical, Philotechnic, Asiatic, Anatomical, Medical, and Agricultural Societies, &c. The principal scientific establishments besides those mentioned in the section upon educational establishments are the Jardin des Plantes and the Observatoire. The former is situated in the south-east of the city, adjoining the Halle aux Vins, and consists of a large garden (75 acres in extent) and several galleries containing large collections of objects belonging to the three kingdoms of nature; and there are in connection with it several professorships, the incumbents of which give gratuitous courses of lectures on geology, zoology, anatomy, physiology, and other subjects. This institution was founded in 1640 by Guy de la Brosse, physician to Louis XIII., but its prosperity dates from the ministry of Colbert (1661–83). The Observatory is situated in the Rue Cassini, in the south of the city. In connection with it is the Bureau des Longitudes, which corresponds with the other observatories of France and with those

of foreign countries, and one of the members of which delivers a public course of lectures on astronomy (founded in 1795).

Manufactures and Trade.—The most important manufactures are articles of jewelry and precious metals, ebony and ivory, trinkets, fine hardware, paper-hangings, saddlery, and other articles in leather; cabinet-work, carriages, various articles of dress, silk and woollen tissues, particularly shawls and carpets, also tapestry (at the Gobelin manufactory, which see); lace, embroidery, artificial flowers, combs, machines, mathematical and optical instruments, types, books, engravings, refined sugar, tobacco (a government monopoly), chemical products, &c. Of all the industries carried on at Paris that which is distinctively Parisian is the making of all kinds of small ornamental articles, for the production of which taste and delicacy of execution are the indispensable requisites, and which, being manufactured almost exclusively in the capital, are called *articles de Paris*. They include trinkets of all kinds, as well real jewelry as what in this country are called gilt toys; objects in morocco and other fine kinds of leather; as also in paper, papier-mâché, ivory, horn, mother-of-pearl, and all the thousand varieties of objects in various materials which are used as ornaments for chimney-pieces, whatnots, &c. The annual value of the products of this nature amounts to several millions sterling. In consequence of the events of 1870–71 this industry was suspended for nearly a year, and it was feared that it had received a blow from which it would never recover, but in 1873 it was again as vigorous as ever.

Means of Communication.—Over thirty lines of omnibuses and forty lines of tramway cars cross the city in every direction from seven in the morning till midnight, and at almost every part of the lines a vehicle passes every five minutes. There are also tramway lines to Versailles, St. Cloud, and other places in the suburbs. The following railways start from Paris for the different parts of the country: the Chemin de fer de l'Ouest for Normandy and Brittany; Chemin de fer d'Orleans, Chemin de fer de l'Est, Chemin de fer du Nord, and Chemin de fer de Paris-Lyon-Méditerranée. Besides these the Chemin de fer de ceinture, belonging to the company of the Chemin de fer de l'Ouest, surrounds the city, and brings all the stations of the great lines into communication.

Administration and Revenue.—Paris is divided into twenty arrondissements, and each of these into four quarters. The administration is in the hands of the prefect of the Seine and the prefect of police. The former is assisted by a municipal council elected by universal suffrage; but the functions of this council, which replaces the municipal commission of the time of the empire, are very limited, and the prefect can disregard their decisions when he chooses. At the head of each arrondissement is a mayor (*maire*), but his authority is merely nominal. The revenue of Paris, a large part of which is derived from the *octrois* or duties levied on goods brought into the city, amounted in 1872 to £19,600,000. In 1801 it was only £501,229; in 1859, the year before the annexation of the districts between the ancient *mur d'octroi* and the fortifications, £4,330,076; in 1860, £8,102,164. At present the total revenue of the city is over £21,000,000.

Health of the City.—The annual mortality of the city of Paris is at the rate of 26 per 1000. In the healthiest arrondissement, that of Chaussée d'Antin, it sometimes descends as low as 15 per 1000, and it is nearly as low in some of the other arrondissements on the north side of the river inhabited by people in good circumstances; while in those on the south side of the river, where a great deal of misery prevails, it rises pretty high, and in the Arrondissement Observatoire sometimes reaches 37 or 38 per 1000. The health of the city has been greatly improved of late years by the works undertaken with the object of increasing the supply of pure water, as well as by the other improvements made during the second empire. Since 1861 the municipal administration has been able to supply the city with 36,932,780 gallons of water daily in dry seasons, and even in times of extreme drought with 26,412,000 gallons, which is equal to more than 11 gallons per head for its population in 1881.

Population.—According to approximate estimates (based, however, in some cases on very uncertain data) the population of Paris was, in the thirteenth century, 120,000; in 1474, 150,000; under Henry II. (1547–59), 210,000; in 1590, 200,000; under Louis XIV. (1643–1715), 492,600; by the census of 1856 (before the annexation of the parts beyond the old *mur d'octroi*), 1,174,346; 1861 (after the annexation), 1,667,841; 1872, 1,851,792; 1881, 2,269,023.

History.—The first appearance of Paris in history is on the occasion of Cæsar's conquest of Gaul, when the small tribe of the Parisii were found inhabiting the banks of the Seine, and occupying as their chief stronghold a few ill-built huts on the island now called Île de la Cité, which was connected with the mainland on the south by two bridges (53 B.C.) To this natural stronghold they gave a name which Cæsar latinized into Lutetia, adding to it Parisiorum (of the Parisii). The name Lutetia is variously explained by etymologists, but the most probable account of it seems to be that it is derived from the Celtic words *loutou-hezi*, meaning Dwelling of the Waters. The inhabitants of this island stronghold defended themselves bravely, but were overcome; and Cæsar, after rebuilding the town, which had been nearly destroyed, surrounded it with walls, and further defended it by erecting two forts at the extremity of the bridges. The Gallic were exchanged for Roman divinities; civilization made rapid progress, and in the course of the 500 years of the Roman dominion Lutetia rose to be a place of considerable importance, and became the capital of Northern Gaul. It was a fortified town in 360 A.D., when the soldiers of Julian here summoned him to fill the imperial throne. In the beginning of the fifth century it suffered much from the northern hordes, and ultimately fell into the hands of the Franks, headed by Clovis, who, having embraced Christianity, made it his capital in 508, taking up his residence in Julian's palace (Palais des Thermes, Hôtel de Cluny), on the left bank of the Seine, one of the halls of which is still to be seen. Under his descendants it became the capital, first of a kingdom of same name, and then of the Kingdom of Neustria. By the later Merovingians, however, it was deserted, and by the Carlovingians entirely neglected. In 987 a new dynasty was established in the person of Hugo Capet, from whose reign downwards Paris has continued to be the residence of the kings of France. In his time the city was still almost confined to the island, and even in the time of Louis VII. (1127–80) it covered in addition only an area of about the same size on the right bank of the river. In the course of his reign, however, the city began to increase rapidly in population, importance, and renown, chiefly in consequence of the development of the schools of learning, and under his successor Philip Augustus (1180–1223), who built the castle of the Louvre and several churches, paved the chief streets, and inclosed the city with a wall flanked with towers, its area was many times as large as it had been in the early part of Louis VII.'s reign. The wall of Philip Augustus extended west as far as the Louvre, north to what is now the Rue

aux Ours, east to past the middle of the easternmost island, and south so as to include the hill on which the Panthéon is built. The next defences of the city were constructed in the reigns of Charles V. and Charles VI. They began with a ditch which was drawn round the city by the celebrated provost of the city, Étienne Marcel, after the battle of Poitiers, and was completed in a year's time (1356–57). The walls were added afterwards. At intervals strong fortresses were planted in the *enceinte*, and the chief of these, erected in the east at the busy Porte St. Antoine, was the original of the Bastille. The Hôtel de Ville and the municipal constitution of Paris date from the same period as the ditch of Étienne Marcel; and though that constitution was abolished by Charles VI. in 1382 it was restored in 1415, from which date till the revolution the provost (*prévôt*) and échevins formed the governing body of the city of Paris. In 1437 and 1438, under Charles VII., Paris was ravaged by pestilence and famine, and such was the desolation that wolves appeared in herds, and prowled about the streets. Under Louis XI. a course of prosperity again commenced. In 1470 the first printing-presses were introduced, and the post-office was established. Francis I. demolished the old castle of the Louvre, and commenced a new palace on its site, rebuilt several churches, opened up better communications between the different districts, and made so many improvements that the whole city assumed a new aspect. But the Reformation having commenced, and counted numerous converts in all parts of the kingdom, bigotry and intolerance in alarm began to do their work, and the fires of persecution were lighted up. Paris in consequence became the theatre of many bloody deeds, crowned at length in 1572, during the reign of Charles IX., by the horrible massacre of St. Bartholomew. During these transactions the city could not prosper; and though some new edifices were commenced, among others the palace of the Tuileries, it was not till the wars of religion ceased at least to be openly carried on, after the accession of Henry IV., that the work of embellishment in good earnest again commenced. A new Hôtel de Ville (the same that was burned down in 1871) was begun, the Pont Neuf finished, great additions made to the Tuileries, and many new streets and quays built. The works begun were completed, and many others undertaken during the reigns of Louis XIII. and Louis XIV., the latter of whom, notwithstanding his lavish expenditure at Versailles, was able to rival all that his predecessors had done for the embellishment of Paris. In the reign of Louis XIV., when Vauban by his fortifications had so defended the frontier of France as to make it seem unnecessary to maintain the Paris walls, they were levelled to the ground after having stood for about 300 years, and the boulevards were formed on their site (1670). Only the Bastille was left (till 1789), and in place of the four principal gates of the old walls four triumphal arches were erected, two of which, the Porte St. Denis and Porte St. Martin, still stand. The next walls of Paris were erected by Louis XVI. in 1782, not for the sake of defence, but with the view of facilitating the levying of the octroi. These were built round a considerably wider circuit than the old boulevards, and the still more recent fortifications which now form the boundary of Paris, and an account of which is given at the beginning of the article, form a larger circle still. Many of the finest edifices of Paris were destroyed during the revolution, but the work of embellishment was resumed by the directory, and continued by all subsequent governments. The reign of Napoleon III. is specially noteworthy in this respect: during it Paris was improved and beautified to an extent surpassing all that had hitherto been effected by any of his predecessors. The most recent events in the history of Paris are the siege of the city by the Germans in the war of 1870–71, and the subsequent siege carried on by the French national government in order to wrest the city from the hands of the Commune. (See FRANCO-GERMAN WAR, and COMMUNE OF PARIS.) The history of Paris is in a great measure that of France, and the reader is accordingly referred to the article FRANCE for a more copious account of the various events alluded to in the above section.

PARIS, in Greek mythology, also called ALEXANDER, the second son of Priam, king of Troy, by Hecuba. His mother, in the first month of her pregnancy, dreamed that she had brought forth a torch, which set the whole city on fire. The soothsayers interpreted this dream as foretelling that the child she should bear would cause the destruction of Troy. Priam, to prevent so great an evil, ordered his slave Agelaus to destroy the child. The slave exposed him on Mount Ida, where he was discovered by a shepherd, who brought him up as his own son. Some attribute the preservation of his life to the tenderness of a she-bear, who suckled him. Young Paris gave early proofs of courage and intrepidity; and for the valiant manner in which he defended the shepherds and their flocks he received the name of Alexander, or the defender of men. His graceful countenance and manly deportment recommended him to the favour of Œnone, a nymph of Ida, whom he married, but afterwards abandoned for Helen. At the marriage of Peleus and Thetis the goddess of discord (see ERIS) threw into the assembly of the gods, who were at the nuptials, a golden apple, on which were the words, 'To be given to the fairest.' Hera, Aphroditē, and Athena claimed the prize, and the decision was referred to Paris. The goddesses appeared before their judge without any covering or ornament, and each tried by promises and entreaties to influence his judgment. Hera promised him a kingdom, Athena military glory, and Aphroditē the fairest woman in the world for his wife. Paris adjudged the prize to Aphroditē. This decision drew upon the judge and his family the resentment of the two other goddesses. Soon after, Priam proposed a contest among his sons and other princes, and promised to reward the conqueror with the finest bull of Mount Ida, which was found in the possession of Paris, who reluctantly yielded it up. The shepherd, desirous of obtaining again this favourite animal, went to Troy, entered the lists of the combatants, and obtained the victory. Hector, enraged to see himself conquered by a stranger, pursued him closely, and Paris must have fallen a victim to his brother's resentment had he not fled to the altar of Zeus. Cassandra by her prophetic power discovered that he was her brother, and Priam acknowledged Paris as his son. He afterwards visited Sparta, the residence of Menelaus, who had married Helena (or Helen), the fairest woman of the age, and was received with every mark of respect; but he abused the hospitality of Menelaus, and persuaded Helen to elope with him. (See HELENA.) Greece took up arms in the cause of Menelaus; Agamemnon was chosen general of the combined forces, and a war was begun. Paris fought with courage, and, according to some, killed Achilles with one of his arrows. On the capture of Troy he was wounded by Philoctetes with one of the poisoned arrows of Hercules, and died from the effects of the wound.

PARIS, MATTHEW, an English monk and historian, was born about 1195–1200. In 1217 he entered the Benedictine monastery of St. Alban's, and in 1235 succeeded Roger of Wendover as chronicler to the monastery. In 1236 he attended the marriage of

Henry III. at Westminster, and he is again mentioned as being at Westminster in 1247. In 1248 he was sent to Norway by Pope Innocent IV. as visitor of the Benedictine order. He was very intimate with Henry III., and had a large number of influential friends besides. He is characterized by his panegyrists as a man of almost universal accomplishments; a mathematician, poet, orator, theologian, painter, and architect, and likewise a man of surpassing integrity. His principal work is his Historia Major, written in Latin, and comprising the annals of eight kings, from the beginning of the Conqueror's reign to the end of that of Henry III., the latter years being added, it is said, by William Rishanger, a monk of the same monastery. This work was first printed in London in 1571; it is composed with candour and impartiality. Another work of his is the Historia Anglorum, called also Historia Minor, a kind of abridgment of the former, but in many points fuller and better than it. An edition of this has been published in the Rolls series, edited by Sir Frederick Madden. Bohn's Antiquarian Library contains a translation of Matthew Paris's Chronicle (the Historia Major) by Dr. J. A. Giles. Matthew Paris also wrote lives of the two Offas, kings of Mercia, and of twenty-three abbots of St. Alban's, &c., and some other works which are supposed to have perished.

PARIS, Plaster of, the name given to gypsum (which see) when ground and used for taking casts, &c. If one part of powdered gypsum be mixed with two and a half parts of water a thin pulp is formed, which after a time sets to a hard, compact mass. By adding a small quantity of lime to the moistened gypsum a very hard marble-like substance is obtained on setting. Substances other than lime are also employed for the purpose of rendering the mass hard and very compact; thus Parian cement consists of plaster of Paris mixed with borax; marble-cement is the same plaster mixed with alum and soda.

PARIS, Treaties of. Of the numerous treaties bearing this designation a few only of the most important can be mentioned here. One concluded on May 20, 1303, between France and England, had for its object the restoration of Aquitaine to Edward I. On Feb. 10, 1763, a treaty of peace was signed between France, Spain, Portugal, and England; and by the same treaty Canada was ceded to Great Britain. On Feb. 6, 1778, was signed that between France and the United States, in which the independence of the latter country was recognized. By another, signed May 15, 1796, between the French Republic and the King of Sardinia, Savoy and Nice were ceded to France. One ratified Nov. 10, 1807, between France and Holland, had for its object the cession of Flushing to the former country. Other treaties are: that between Napoleon I. and the allies, ratified April 11, 1814, by which Napoleon was deposed and banished to Elba; the convention between Count d'Artois and the allies for the cessation of hostilities and evacuation of France, signed April 23, 1814; the convention of August 2, 1815, between Great Britain, Austria, Russia, and Prussia, intrusting the charge of Napoleon to the British government; the treaty between France and the other great European powers, ratified Nov. 20, 1815, in which the boundaries of France are defined, and provision made for the temporary garrisoning of French fortresses; that between France and Portugal for the cession of Guiana to France, concluded Aug. 28, 1817; that for the conclusion of peace between Russia on the one hand, and France, Austria, Turkey, and Great Britain on the other, ratified March 30, 1856; the treaty of May 26, 1857, between the great powers of Europe with regard to Neufchâtel; the convention constituting the Danubian Principalities, 1858; and lastly, the treaty of peace with Germany, concluded May 10, 1871, and modified by the convention of October 12, 1871, by which France lost one entire department, that of the Bas-Rhin; two arrondissements, with the greater part of the third, of the adjoining department of the Haut-Rhin; and the greater portion of the department of the Moselle, together with a number of cantons and communes in the departments of Meurthe and the Vosges.

PARIS, University of, a learned institution of great renown in the middle ages, but abolished during the French revolution. Its foundation has often been erroneously attributed to Charlemagne, who merely established some lay schools. The university proper did not come into existence till the beginning of the thirteenth century. Even the name university was not at first used in an absolute sense, and did not come into use in this manner till the time of St. Louis (1226–70). The phrase *Universitas magistrorum et auditorum* was used to designate the whole body of masters and scholars. Philip Augustus (1180–1223) was the first to prescribe regulations for the schools of Paris, and to accord to them university privileges. There were at that time three Parisian schools—one at Notre Dame, one at the abbey of St. Victor, and the third on the southern slope of the hill of Sainte-Geneviève. These schools had risen into fame in the course of the twelfth century, first through the labours of Guillaume de Champeaux (died 1121), a Realist, and the introducer of the scholastic philosophy into France, but still more through those of his successor Abelard, who was the first to attract scholars to Paris not only from all parts of France, but also from the surrounding countries. To maintain order among the students that henceforth streamed into Paris from all quarters disciplinary enactments were necessary. The first classification of the students, made in 1169, divided them into four nations: the nation of France, styled *Honoranda;* that of Picardy, styled *Fidelissima;* that of Normandy, styled *Veneranda;* and that of England, replaced under Charles VI. by that of Germany, styled *Constantissima*. Students from all Christian countries were enrolled in one or other of these nations. Each nation was governed by a procurator. The studies were divided into two branches, the faculties of arts and theology, each of which was presided over by a dean. The other two faculties of law and medicine were not created till the thirteenth century. The head of the university had the title of rector. From the twelfth century the assembly of masters (*consortium magistrorum*) shared with the chancellor of Notre Dame the right of conferring the degrees necessary to entitle students to become teachers. The degree of bachelor might be obtained at the age of twenty-one, after six years of study in the faculty of arts; to obtain a license (namely, to teach on one's own account), which advanced the scholar to the dignity of Master of Arts (*maître ès-arts*), it was necessary to have taught for two years under the direction of a Master of Arts or doctor. The privileges which the university successively acquired at the hands of royalty soon made it a powerful corporation. Its renown and authority extended to all parts. John of Salisbury, Roger Bacon, Raymond Lully, Brunetto Latini, and Dante were among those who came to receive the benefit of its instruction. The University-quarter (*quartier de l'Université*, afterwards *quarter latin*) formed a sort of republic, with its own institutions and a separate jurisdiction. Its members were judicially answerable only to the provost of the city, who gloried in the title of Conservator of the University of Paris. The university sent deputies to the councils, and was not required to contribute anything to the maintenance of the state. The first statutes of the university were

drawn up in 1215 by Robert de Courson. Strong in their privileges, over which a syndic was appointed to watch, the students frequently sought occasions of dispute and strife with the citizens, and when the provost of the city decided against them, the university suspended its functions. It was during a suspension of this nature, which lasted for two years, from 1229 to 1231, that the Dominicans and Franciscans set up their first schools at Paris. At the same time houses were opened by benevolent persons to lodge poor scholars gratuitously, and to render their life more regular. Endowed by popes, kings, great dignitaries of the church, and powerful families, these *colléges* soon had completely organized teaching bodies within their own walls. Such was the origin of the colleges of Sorbonne (1250), Bons-Enfants (1257), Harcourt (1280), Bayeux (1303), Navarre (1304), &c. Under the protection of kings and popes the university continued uninterruptedly to grow in importance. Philip the Fair appealed to it for support in his quarrels with the Holy See. It was represented in the États-Généraux of 1308, which decided the fate of the Templars. From Charles V. it received the title of 'Eldest daughter of the kings' (*Fille aînée des rois*), and thenceforward took rank after the princes of the blood. During the great schism of the West (1378–1429) it was the soul of the councils of Pisa, Constance (where it was represented by Gerson), and Basel. At all times it defended the liberties of the Gallican Church, and at the time of the Reformation it stood forth zealously on behalf of Catholicism. Yet such was its authority that at one time Luther offered to take it as his judge and to submit to its decision. Yet the hour of its decline was approaching. It could not hold its own against the colleges that now began to be established by the Jesuits, who, along with the Dominicans and Franciscans, gradually succeeded in bringing into their own hands the secondary education in France. By the end of the sixteenth century the University of Paris had lost all political importance, and it did not even send deputies to the États-Généraux of 1614. It was suppressed by a decree of the Convention, dated the 20th of March, 1794, after which a new educational system was established in France. See FRANCE—Instruction and Public Worship.

PARISH (Greek, *paroikia*, habitation; Latin, *parochia*) anciently signified the diocese of a bishop; now, however, it is applied to designate the territorial bounds attached to a particular church of the established religion, and (in England) for the support of which church alone the tithes within those bounds can be allocated. No exact date can be assigned to the period when the division of the country into parishes was first effected. According to one authority, Camden, England was divided into parishes by Archbishop Honorius about the year 630; but, in the view of Sir Henry Hobart, parishes were first erected by the Council of Lateran, held in 1179. The more probable view, however, is that parishes were gradually formed at various dates intermediate between these two, and presumably before the end of the tenth century; for we find it decreed in a law of King Edgar, about 970, that all the tithes—which had previously been allocated in an arbitrary manner—should thenceforth be assigned to the particular church to which the parish belonged, proving that the kingdom was at that time universally divided into parishes. The boundaries of parishes seem to have corresponded originally with those of manors; for though there are often a number of manors in one parish, it seldom happens that a manor lies in more than one parish. As Christianity spread itself the lords of the soil erected churches on their lands for the accommodation of their tenants, and obliged all their tenants to set apart their tithes for the support of the officiating minister; and this tract of land the tithes whereof were so appropriated formed a distinct parish. Some lands had no churches erected upon them, and these still continue extra-parochial, the tithes being appropriated to the sovereign for the good of the church. The boundaries of parishes, which even up to the present day depend upon ancient custom, were preserved by perambulations performed annually in rogation week. Several acts affecting these boundaries have been passed in the present reign; see 1 Vict. cap. lxix. s. 2, 2 and 3 Vict. cap. lxii. s. 34–36, 3 and 4 Vict. cap. xv. s. 28, 8 and 9 Vict. cap. cxviii. s. 39–45, and 12 and 13 Vict. cap. lxxxiii. s. 1, 9. By 6 and 7 Vict. cap. xxxvii., and 7 and 8 Vict. cap. xciv., facilities are afforded for the subdivision of populous districts, and for their formation into separate parishes for all ecclesiastical purposes. The scheme for the formation of each new parish has to be submitted to her majesty in council, previous notice being given of the same to the patron and incumbent of the parish. This act, however, does not affect parochial rights or privileges otherwise than as expressly provided. By 19 and 20 Vict. cap. civ. a district containing a church may become a new parish on being constituted a separate district by order in council.

A parish is an important division of the country for civil as well as ecclesiastical purposes. Most of the local rates and taxes are leviable within its bounds. The inhabitants of each parish are answerable for the preservation of the highways in the district, unless by prescription they can throw the burden on particular persons by reason of their tenure; and if the inhabitants of a township are exempted from repairing the roads within the township, it falls on the rest of the parish.

In Scotland the division into parishes dates from a very early period. The bounds of each parish are precisely fixed. It had, however, been found necessary in many cases to subdivide some parishes and unite others; and in order to effect this, powers were conferred by different statutes upon commissioners for the planting of churches, &c. These powers were ultimately transferred to the Court of Session as commissioners by the act 1707, cap. ix., under which act that court is empowered, with the consent of three-fourths of the heritors, to erect new churches and to disjoin parishes. But they may annex or unite two parishes into one, on cause shown, without the consent of the heritors. By 7 and 8 Vict. cap. xliv. the consent of the majority of the heritors is sufficient; and by the same act any district in which there is an endowed church may be erected into a parish *quoad sacra*, for purely ecclesiastical purposes.

One of the most important civil purposes which parishes in Scotland subserve is connected with the administration of the poor law. This law was formerly administered in country parishes by the kirk-session, and in town parishes by the magistrates or their nominees; but by act 8 and 9 Vict. cap. lxxxiii. the administrating body has been materially altered. Two or more parishes can be combined for poor-law purposes into one district. Besides the parish church there existed, previous to the Education (Scotland) Act of 1872, in each parish a parish school (which see). The maintenance of the church fabric is the duty of the heritors.

PARISH CLERK is an officer in the Church of England, whose principal duties are to make the responses to the minister, read lessons, &c. He must be at least twenty years of age, and of good reputation. The appointment is generally made by the minister, and is regarded in law as made for life; so that, though the clerk may be punished, yet he can-

not be deprived of his office, by ecclesiastical censures. Formerly the parish clerk was a clerk in orders, whose business it was to officiate at the altar; now he is usually a layman, though by 7 and 8 Vict. cap. lix. a person in orders may be elected to the office. His emoluments consist of certain fees on christenings, marriages, burials, &c., besides fixed wages.

PARISH SCHOOL. The foundation of parish schools in Scotland is due to John Knox. In his celebrated Book of Discipline it is laid down that in order to provide for 'the virtuous and godly education of the youth, it was judged in every parish to have a proper schoolmaster, able to teach at least the grammar and the Latin tongue, where the town was of any reputation; but in landward parishes, where the people convened to doctrine only once in the week, there must either the reader or the minister take care of the youth of the parish to instruct them.' The establishment of such schools was authorized by act of Parliament in 1615; and by act 1696, cap. xxvi., it was required that where no parochial school had been before established the heritors were to provide a school-house and pay a certain sum, depending on the valued rent of the parish, for the support of the schoolmaster. If the heritors neglected to carry out this enactment the presbytery were directed to apply to the commissioners of supply of the county, who were empowered to establish a school and fix the salary in terms of the act. By act 1693, cap. xxii., the sufficiency and qualification of the parochial schoolmasters, as well as their conduct after their admission, were to be judged by the presbytery. By the statute 43 Geo. III. cap. liv., by which the parish schools were to be thenceforth regulated, the choice of the schoolmaster was vested in the minister and heritors—the person elected being found qualified by the presbytery as to morals, religion, and literature, and signing the Confession of Faith and Formula of the Church of Scotland. An act passed in 1861 made important alterations and modifications on previous acts relating to parish schools. Amongst other things it was enacted that the examiners of schoolmasters should consist of three professors of arts and three professors of divinity, that it be not required of schoolmasters to sign the Church of Scotland formulæ, and that the jurisdiction of the presbytery in cases of immoral conduct or cruelty should be transferred to the sheriff. The Education (Scotland) Act of 1872 (35 and 36 Vict. cap. lxii.) repealed the various acts above alluded to, and parish schools in their distinctive character now exist no longer, being transferred to the control of the school-boards, and are in no way distinguished from other board schools save in so far as teachers in office before the operation of the act are not prejudiced by its provisions. In England no such system as that now treated of ever existed, its system of national education dating only from 1870.

PARK, MUNGO, an enterprising traveller, who fell a victim to his repeated attempts to explore the interior of the African continent. His father was a farmer, and he was born near Selkirk, in Scotland, September 10, 1771. He was educated for the medical profession, and after having studied at Edinburgh for three years was apprenticed to a surgeon of Selkirk. On quitting this situation he went to London, and was appointed to the post of assistant-surgeon on board one of the vessels of the East India Company in a voyage to India. Returning to England in 1793 he engaged in an expedition to the intertropical regions of Africa to trace the course of the river Niger, under the patronage of the African Society. He arrived on the coasts of Senegal in June, 1795, and having made himself acquainted with the Mandingo language commenced his journey into the interior. Travelling in an easterly direction he passed through the Kingdoms of Woolli, Bondu Kajaaga Kasson, Kaarta, and Ludamar, and in general was well received, but in passing through Ludamar he was arrested by the Moors and subjected to a harsh imprisonment. He succeeded, however, in effecting his escape, and on the 20th July, 1796, after wandering for three weeks in the desert, came upon the Niger, the great object of his journey. He traced its course for a considerable distance, but from the insuperable character of the obstacles he encountered was obliged to retrace his steps. Before reaching the coast, however, he was overtaken by a sickness which laid him up for several months, so that it was the end of 1797 before he arrived in England. He published an interesting account of his journeys in a work entitled Travels in the Interior of Africa (London, 1799). Park, after his return, married and settled as a surgeon at Peebles, but was induced in 1805 to take the command of a new expedition sent out by the British government for the purpose of exploring the course of the Niger. His first journey had made known its easterly course (see NIGER), but he had not been able to follow it down to its mouth. His plan now was to cross the country from the western coast, enter Bambarra, construct two boats, and, embarking on the river, reach the sea. He set out from Pisania, on the Gambia, in April, with thirty-six Europeans, of whom thirty were soldiers and the rest mechanics, and liberally provided with presents and merchandise. His impatience had led him to set out in the wet season, and of thirty-eight men who had left the coast with him seven only survived when he reached the Niger in August. Having finally procured permission to build a boat at Sansanding, he embarked at that place November 17, but not before he had sent by Isaaco, his interpreter, his journal, along with some letters, to Gambia, which place they reached in safety. Four Europeans only survived to embark with him. Some time having elapsed without any intelligence being received of him, Isaaco was despatched to procure information. Isaaco succeeded in finding the person who had taken his place as interpreter, and from him received a journal containing an account of the voyage, from which it appeared that the party had been attacked by the natives at Boussa, and all killed, with the exception of one slave. Clapperton, in his second journey, received accounts confirming this statement, and visited the spot where the travellers perished. He was also informed that the Sultan of Youri had some of Park's papers, which he was willing to give up if he would pay him a visit. The Landers also visited the place, and were shown by the sultan, or king, one of Park's books, which they describe as a nautical book, containing tables of logarithms. Another account of his fate states that he was drowned in the Niger. The Journal of Park's Second Expedition was published, with a memoir of his life, in 1815. A monument to the memory of Park was erected at Selkirk in 1859.

PARKER, the name of a family celebrated in the British naval annals, owing its origin to HUGH PARKER, an alderman of London, who was made a baronet in 1681, and died in 1697.—His grandnephew, SIR HYDE PARKER, entered the navy, fought bravely against the French and Spaniards, was vice-admiral of the blue, and in 1781 engaged the Dutch admiral Zoutman off the Dogger-bank. Both sides claimed the victory, but the result was that three of the Dutch ships were destroyed, and the rest obliged to take refuge in their own harbours. In 1783 he was appointed to the command of the British fleet in the East Indies, but perished on his way thither, the

ship in which he sailed having foundered, carrying all on board to the bottom.—His second son distinguished himself in the American war, and in 1801 commanded the fleet which was sent to the Baltic to break up the northern coalition formed by the Russian emperor, Paul I. He had no proper share in the victory gained by the bombardment of Copenhagen, as Nelson gained it by refusing to retire according to his orders. He was preparing to make an attack upon Cronstadt when the news of Paul's death rendered it unnecessary. — His cousin, Sir William Parker, gained a victory over the French fleet in 1794, and contributed to the victory off St. Vincent in 1797.—Sir Peter Parker, born in 1716, distinguished himself as a naval officer both in the Seven Years' and the American wars, defeated the French admiral De Grasse, and brought him prisoner to England. He attained the advanced age of ninety-six, and died in 1811.—Sir George Parker, nephew of the preceding, born in 1766, entered the navy at the age of ten, and gained for himself considerable renown both in Europe and in India. In 1807 he was appointed to the command of the squadron then in the Baltic. He afterwards took a part in the Walcheren expedition, and was successively appointed to the posts of rear-admiral, vice-admiral, and admiral. He died in 1847.—Sir William Parker, born in 1781, also entered the naval service of his country at an early period of life. In 1806, when in command of the frigate *Amazon*, he greatly distinguished himself by the capture of the *Belle-Poule*, a French frigate; and in 1809 he made himself master of the citadel of Ferrol. In 1835 he was made a lord of the admiralty, a post he resigned in 1841 in order to take the command of the fleet operating at that time against China. In conjunction with the troops under Gough he took Shusan, Ningpo, and Shapu; forced the entrance of the Yang-tse-kiang, and appeared before Nanking, where terms of peace were agreed upon. A baronetcy was conferred upon him in 1844, and he was soon afterwards invested with the command of the fleet in the Mediterranean. His efforts to mediate between the Neapolitan government and the insurgent Sicilians were without success. In 1849, at the request of Sir Stratford Canning, he sailed to the Dardanelles to support the Porte against the demands of Russia and Austria as to fugitives. He next proceeded to Athens, and obliged the government, by a blockade of their ports, to accede to the demands of Britain; whereupon he returned to Malta. In 1851 he was appointed admiral of the blue; in 1863, admiral of the fleet; and on the 12th November, 1866, he died.

PARKER, Matthew, the second Protestant archbishop of Canterbury, was born at Norwich, Aug. 6, 1504, entered Corpus Christi College, Cambridge, in 1520, and graduated as B.A. in 1524. Three years afterwards he was ordained a priest, and chosen a fellow of his college. His favourite studies were the Scriptures, the church fathers, and other ecclesiastical writers; and such was the diligence with which he applied himself to these pursuits that he soon acquired no inconsiderable reputation for his familiarity with that branch of literature. In 1533 he was made chaplain to Queen Anne Boleyn, by whom he was held in such esteem that shortly before her death she commended to him in a special manner her daughter Elizabeth, whom she exhorted to profit by his wise and pious counsel. In 1535 he was preferred to the deanery of the college of Stoke-Clare in Suffolk, a position he made use of for the reform of abuses and the suppression of the many superstitious practices that obtained at that time among the people, as well as for making provision for the instruction of the youth of the community, through the foundation of a grammar-school in that district. He seems early to have imbibed reformation principles, as from the very first much of his preaching was directed against certain of the tenets and superstitions of the Romish Church. In 1537, after the death of Anne Boleyn, Henry VIII. made him one of his chaplains, and a year or two afterwards appointed him to one of the prebends of Ely. In 1538 he took the degree of D.D.; in 1544 was appointed to the mastership of Corpus Christi College, Cambridge, for which he compiled a new body of statutes; and in the following year was elected vice-chancellor of the university, and presented with the rectory of Land Beach. In 1547 he married Margaret Harlstone, the daughter of a Norfolkshire gentleman. At the time of Kett's rebellion, in 1549, he rendered considerable service by his exhortations and sermons; and did not scruple even to address the rebels in their camp, fearlessly reprobating their conduct and exhorting them to submission. In 1552 he was elected prebendary and afterwards dean of Lincoln; but on the accession of Mary to the throne he was stripped of these as well as his other preferments, though he seems to have escaped much of the persecution to which his co-religionists were subjected. A portion of his time he now spent in translating the Psalms into English verse, a translation which was afterwards published. He also wrote a treatise, De Conjugio Sacerdotum, defending the marriage of priests. When Elizabeth succeeded to the throne he was raised to the archbishopric of Canterbury, his consecration taking place Dec. 17, 1559. For this exalted position his piety and prudence, no less than his great learning, rendered him peculiarly fitted, though his zeal, frequently getting the better of his judgment, caused him to conduct himself with great intolerance alike towards Catholics and Puritans, by both which parties he was regarded as one of their chief enemies. In 1568 was published, under Archbishop Parker's direction and at his expense, the Bishops' Bible, which was a revision of the text founded on Cranmer's translation; he was likewise prominently associated with those who drew up the Book of Common Prayer. He edited the histories of Matthew of Westminster, Matthew Paris, and others; and had a considerable share in the work De Antiquitate Britannicæ Ecclesiæ.

Archbishop Parker was the founder of the Society of Antiquaries. His valuable collection of MSS. relating to the civil and ecclesiastical history of England he presented to his own college at Cambridge, and founded a number of valuable fellowships there. He died at Canterbury, May 17, 1575.

PARKER, Theodore, an American clergyman, was the son of a Massachusetts farmer, and born at Lexington, 24th August, 1810. He studied at Harvard University as a theological student in connection with the Unitarian persuasion, and in 1837 was settled as a preacher at West Roxbury. The views enunciated by him were of too extreme a kind even for many of his own sect, but the eloquence and ability which he displayed in promulgating them soon attracted general attention, and made him famous as a preacher and lecturer over New England. In 1843 he went to Europe, visiting England, France, Italy, and Germany, and returning in the following summer. In 1845 he was transferred to Boston, where he assembled a crowd of auditors every Sunday in the Melodeon. He took a special interest in the abolition cause, and denounced with all his energy the passing of the Fugitive Slave Act of 1850. In the celebrated case of the slave Burns he was prosecuted for sedition, owing to an address which he had delivered against the giving up of the fugitive, but was acquitted by an informality in the indictment.

His incessant toils at length undermined his constitution, and in 1859 he set out on a visit to Europe, in the hope of re-establishing his health. He spent the winter of 1859 at Rome, and setting out from thence, very much enfeebled, in April, 1860, reached with difficulty Florence, where he died on 10th May, and was buried in the cemetery outside the walls of the town. The writings of Theodore Parker consist mainly of sermons, addresses, and articles contributed to the Dial, the Christian Register, the Christian Examiner, and the Massachusetts Quarterly, a review of which for three years he was joint-editor with Emerson and Cabot. The principal of his published works are, Miscellaneous Writings (Boston, 1843); A Discourse of Matters pertaining to Religion (1849); Occasional Sermons and Speeches (two vols. 1852); and Sermons on Theism, Atheism, and the Popular Theology (1853).

PARK OF ARTILLERY. See ARTILLERY.

PARLIAMENT. The name *parliament* (French, *parlement*, from *parler*, to speak, and ultimately from the Greek *parabolē*, a parable) was formerly given to the highest courts in France, Naples, and some other countries. They originated from the ancient diets and courts held by the kings, which were called *parliaments*, particularly if held at extraordinary times. The barons decided legal cases, with the aid of the clergy, the magnates, and the chancellor, as was natural in times when the three branches of government were so confusedly mingled. But the kings of France soon appointed counsellors versed in the law to decide the complaints and appeals brought to their court by the inhabitants of their hereditary lands; and the same was done by the feudal princes, the Dukes of Normandy, Guienne, Burgundy, Brittany, and the Prince-counts of Champagne, Toulouse, Provence, &c. These counsellors were not originally proper judges, but merely made reports, and always followed the court. But what John of England had been obliged to promise in the Magna Charta, as early as 1215—a permanent court confined to one place—was by degrees demanded in all countries. Philip IV. (the Fair) of France established a permanent court at Paris in 1294, for the provinces belonging to the immediate domains of the crown, which were divided into four districts. In 1305 this institution was enlarged. In the beginning this court held but two sessions annually, continuing, however, for weeks and months, namely, at Easter and All-Saints; but when the business of the court increased, its sessions became permanent in 1422. The vassals of the royal hereditary dominions had seats and votes in the parliament, which, at a later period, passed over to the peers of France; but the business actually fell upon the counsellors, who were lawyers. The Parliament of Paris consisted, before the French revolution, of five chambers, the *grande chambre*, with ten presidents, twenty-five temporal and twelve spiritual counsellors; three *chambres des enquêtes*, each with two presidents and twenty-three counsellors; and the *chambre des requêtes*, with two presidents and fourteen counsellors. Criminal cases were tried in the *chambre de la Tournelle*, in which members of all the chambers sat in turn. The crown advocates belonged also to the parliaments, with upwards of 500 lawyers, and a great number of subalterns. Some of the feudal principalities, even before their union with the crown, had similar tribunals; the county of Toulouse, for instance, had a parliament, Normandy her great feudal court (*scaccarium* or *echiquier*) at Rouen. After the union with the crown parliaments were erected by degrees for the other provinces; at Toulouse, at Grenoble for Dauphiné, Bordeaux for Guienne, Dijon for Burgundy Besançon for Franche Comté, Rouen, Aix for Provence, Pau for Béarn, Rennes for Brittany, Metz for the three bishoprics Metz, Toul, and Verdun, Douay for Flanders, and Nancy for Lorraine. The form of publication of the royal decrees consisted in sending them to the parliaments, which entered them in the registers, and transmitted them to the lower courts. This gave to these courts a peculiar political influence. They insisted that they had the right to make protestations to the king against decrees, and that thus they represented the estates of the realm. In early times the court sometimes yielded. From the time of Louis XIV., however, the registering of the decree was generally obtained by the king's appearing personally in parliament, when no debate was permitted, and the registering was ordered in a *lit de justice* (which see). Refractory parliaments were banished to Tours, Compiègne, or Orleans. But the resistance of the parliaments could not always be thus overcome. The parliaments, whose members had bought their places for the sake of the dignity, showed great obstinacy, and it was sometimes necessary to yield to them. Hence Louis XV., towards the end of his reign, adopted a bolder and more fundamental measure: all the old parliaments were abolished in 1771, the sums for which the places had been bought were paid back, the new places filled by the king only, and the old members in part banished to small and remote towns, and in part imprisoned. For a long time no lawyer was willing to plead before the new courts, and when at length the administration of justice was recommenced, the king died, and Louis XVI. restored the old parliaments. They immediately renewed their opposition to the court, the ministers, and the superior clergy; refusing everything, just and unjust, desired by the court. The Archbishop of Sens abolished them again in 1788; but the courts established by him were acknowledged by no one. At length the parliament declared that the assembly of the States-general alone was capable of granting what the government desired, and thus gave the signal to that revolution in which it was one of the first things overthrown.

Parliament of Great Britain.—A sketch of its constitutional power and organization is given in the article BRITAIN. At present we shall only give some particulars respecting the meeting of Parliament, and the forms of doing business. The two houses of Parliament having met on the appointed day in their respective chambers, the lord-chancellor, in the House of Lords, acquaints the House with the issue by her majesty of a commission, under the great seal, for the opening and holding of Parliament. The Commons are then summoned by the Lords' commissioners to attend in the House of Lords, to hear the commission read. After the reading of the commission the lord-chancellor opens Parliament, by stating that, as soon as the members have been sworn, her majesty will declare her reasons for calling the Parliament, and that meanwhile the Commons proceed to the election of a speaker, and present him there on the following day for the royal approbation. The Commons then withdraw to the Lower House, and choose a speaker, previous to the election of whom the clerk of the House acts as speaker. After his election the administration of the requisite oaths to the members is then proceeded with in both Houses, the lord-chancellor in the Lords, and the speaker in the Commons being the first to take the oaths. When most of the members have been sworn, the purposes for which Parliament has been assembled are then declared, either by the queen in person or by representation. After the royal speech, containing this declaration, has been read in presence of the members of both Houses, the House is adjourned,

to meet, however, later in the day, in order to move a reply to the speech. But before doing this it is usual to take up some other business *pro formâ*, with a view to assert their right of deliberation irrespective of the immediate occasion of their being summoned.

A house for the transaction of business must consist of at least forty members, otherwise the speaker will not take the chair. The speaker of the House of Commons cannot take part in a debate in the House, and can only speak on questions of order or practice, and the like, such as determining the precedence of members rising to address the House, examining witnesses at the bar, explaining any doubts that may arise on bills, putting the matter of debate in a concise form for the decision of the House, &c. He can only vote in cases where the votes are equally divided, or in committees of the whole house, when he vacates the chair, and is reduced to the footing of an ordinary member. The lord-chancellor is *ex officio* the speaker of the House of Lords. Unlike the speaker of the Commons, the lord-chancellor can both speak and vote in the House. In the case of equality of votes, the rule always is that the presumption is in favour of the negative side. When a division takes place in the Commons, the practice is that both parties retire into separate lobbies provided for that purpose, and be counted as they re-enter the house, by two tellers on either side, who are appointed by the speaker. Each House has its *Standing Orders*, which are a series of regulations adopted at various periods from 1685 to the present time, relating partly to the internal order of the House, and partly to certain preliminaries and forms required in the introduction of particular bills, both public and private, and to the promulgation of statutes. Prayers are read in both Houses before the commencement of business. Every member is bound to attend the House. In the Upper House attendance by proxy is admissible, and under certain restrictions voting by proxy. The rule of attendance is not in ordinary circumstances enforced. A call of the House is an expedient used on occasions of importance to secure the attendance of members; when it is made members absent without permission are liable to be apprehended. No member can be present on the debate of a bill or other business concerning himself. When the speaker's mace lies on the table of the House of Commons it is a house; when under, a committee; when out of the house no business can be done; and when in the hands of the sergeant at the bar no motion can be made. Motions are made and petitions presented by a member in his place. The mover of a motion puts it in writing, and delivers it to the speaker, who, when it has been seconded, puts it to the House, after which it cannot be withdrawn without the consent of the House. In the House of Lords a seconder is not required; but when a motion has been made a question is proposed, 'that it be agreed to.' There are various ways in which a motion may be superseded, such as by the adjournment of the House, by the motion that the orders of the day be now read, and by the moving of the previous question. The House is adjourned at any time when it is noticed that fewer than forty members are present.

The method of making laws is much the same in both Houses. In each House the act of the majority binds the whole; and this majority is declared by votes openly given. To bring a bill into the House of Commons, if the relief sought by it is of a private nature, it is first necessary to prefer a petition, which must be presented by a member, and usually sets forth the grievance desired to be remedied. This petition (when founded on facts that may be disputed) is referred to a committee of members, who examine the matter alleged, and report to the House; and then (or otherwise upon the mere petition) leave is given to bring in the bill. In public matters, the bill is brought in upon motion made to the House without any petition. This is read a first time, and after a convenient interval a second time; and after each reading the speaker puts the question whether it shall proceed any further. The introduction of the bill may be originally opposed, as the bill itself may at either of the readings; and if the opposition succeeds the bill must be dropped for that session, as it must also if opposed with success in any of the subsequent stages. After the second reading it is committed, that is, referred to a committee, which is either selected by the House in matters of small importance, or else, if the bill is a matter of great or national consequence, the House resolves itself into a committee of the whole house. A committee of the whole house is composed of every member, and, to form it, the speaker quits the chair (another member being appointed chairman), and may sit and debate as a private member. In these committees the bill is debated clause by clause, amendments made, the blanks filled up, and sometimes the bill entirely new-modelled. After it has gone through the committee the chairman reports it to the House, with such amendments as the committee have made; and then the House re-consider the whole bill again, and the question is repeatedly put upon every clause and amendment. When the House have agreed or disagreed to the amendments of the committee, and sometimes added new amendments of their own, the bill is then ordered to be reprinted. At this stage the former practice used to be to engross the bill on one or more long rolls of parchment sewed together, but this was discontinued in 1849. It is then read a third time, and amendments are at this stage of its progress sometimes made to it; if a new clause be added, it is done by adding what is called a *rider*. The speaker then once more states the nature of the bill, and, holding it up in his hands, puts the question whether the bill shall pass. If this be agreed to the title is then settled. After this one of the members is directed to carry it to the Lords, and desire their concurrence. This member, attended by several more, carries it to the bar of the House of Peers, and there delivers it to the chancellor, who comes down from his woolsack to receive it. It there passes through the same forms as in the other House, and if rejected no more notice is taken of it, in order to prevent unbecoming altercations. But if it be agreed to the Lords send a message by two masters in chancery (or sometimes, in matters of high importance, by two of the judges), that they have agreed to the same; and the bill remains with the Lords, if they have made no amendment to it. But if any amendments are made, such amendments are sent down with the bill to receive the concurrence of the Commons. If the Commons disagree to the amendments a conference usually follows between members deputed from each House, who, for the most part, settle and adjust the difference; but if both Houses remain inflexible, the bill is dropped. If the Commons agree to the amendments the bill is sent back to the Lords by one of the members, with a message to acquaint them therewith. The same forms are observed, *mutatis mutandis*, when the bill begins in the House of Lords, with the difference that when it is of a private nature it is referred to two of the judges to examine and report the state of the facts alleged, to see that all necessary parties consent, and to settle all points of technical propriety. But when an act of grace or pardon is passed, it is first signed by the sovereign, and then read once only in each of the Houses, without any new engrossing or amendment.

And when both Houses have done with any bill it always is deposited in the House of Peers, to wait the royal assent, except in the case of a money bill, which, after receiving the concurrence of the Lords, is sent back to the House of Commons. The answer to the question put by the speaker, or the chairman, in the House of Commons, is 'Aye' or 'No;' and in the House of Peers, 'Content' or 'Not content.'

The royal assent to bills may be given, 1, in person. When the queen is to pass bills in person, she appears on her throne in the House of Peers in her royal robes, with the crown on her head, and attended by her great officers of state and heralds, and sends a message requiring the presence of the members of the House of Commons. The titles of all bills that have passed both Houses are read, and the queen's answer is declared by the clerk of the Parliament in Norman-French. If the queen consents to a public bill, the clerk usually declares, 'La reigne le veut' (The queen wills it); if to a private bill, 'Soit fait comme il est désiré' (Be it as it is desired). If the queen refuses her assent, it is in the gentle language of 'La reigne s'avisera' (The queen will take it into consideration). When a money bill is passed, it is carried up and presented to the queen by the speaker of the House of Commons, and the royal assent is thus expressed, 'La reigne remercie ses loyaux sujets, accepte leur bénévolence, et aussi le veut' (The queen thanks her loyal subjects, accepts their benevolence, and wills it so to be). In case of an act of grace, which originally proceeds from the crown, and has the royal assent in the first stage of it, the clerk of the Parliament thus pronounces the gratitude of the subject: 'Les prélats, seigneurs, et communs, en ce present parlement assemblés, au nom de tous vos autres sujets, remercient très humblement votre majesté, et prient à Dieu vous donner en santé bonne vie et longue' (The prelates, lords, and commons in this present Parliament assembled, in the name of all your other subjects, most humbly thank your majesty, and pray to God to grant you in health a long and happy life). 2. The queen may give her assent by letters-patent under her great seal signed with her hand, and notified in her absence, to both Houses assembled together in the Upper House, by commissioners, consisting of certain peers named in the letters. And when the bill has received the royal assent in either of these ways, it is then, and not before, a statute or act of Parliament. This statute or act is placed among the records of the kingdom; there needing no formal promulgation to give it the force of a law, as was necessary by the civil law with regard to the emperor's edicts; because every man in England is, in judgment of law, party to the making of an act of Parliament, being present thereat by his representatives. However, copies thereof are usually printed at the queen's press, for the information of the whole land. An act of Parliament cannot be altered, amended, dispensed with, suspended, or repealed, but in the same forms, and by the same authority of Parliament; for it is a maxim in law, that it requires the same strength to dissolve as to create an obligation. The forms of doing business in the Congress of the United States of America are substantially the same as in the British Parliament.

The privileges of Parliament are large and indefinite, and are partly limited by statute, and partly by known precedent; but they are to a great extent customary, and the Houses themselves are the only tribunals which can determine an alleged violation of them. 'The law of Parliament,' says Hallam, 'as determined by regular custom, is incorporated into our constitution; but not so as to warrant an indefinite uncontrollable assumption of power in any case, least of all in judicial proceedings, where the form and essence of justice are inseparable from each other.' Certain privileges, however, are clearly defined. The first is freedom of speech in debates. But if any member in the course of a debate use offensive words, he may be called to the bar to receive a reprimand from the speaker, or, if the offence be great, he may be committed to the Tower. The next privilege is that of freedom from arrest in civil suits. This privilege is enjoyed always by Peers, and in the case of the Commons during the sitting of Parliament, and for forty days after each prorogation, and as many days before the date to which it has been prorogued. Two privileges are peculiar to the House of Lords; that possessed by every peer of giving his vote by proxy, and that of entering on the journals of the House his dissent from a vote of the House, together with his protest or reasons of dissent. Of the peculiar privileges of the House of Commons, the most important is that of originating all money bills.

PARMA, a town of Italy, capital of the province of Parma, on the Parma, which divides it into two unequal parts, and is crossed by three bridges, 72 miles south-west of Milan. It is of a circular or oval shape, surrounded by walls flanked with bastions, defended by a castle, and entered by five gates. It has a gay and animated appearance, everything indicating prosperity and a rapid course of improvement. It is laid out with considerable regularity. The old Roman Via Æmilia traverses it centrally throughout its whole length east to west, forming the principal street, while several others take the same direction, or cross it at right angles. The principal squares are four, and one of them, the Piazza Grande, near the centre of the town and in the line of the Via Æmilia, is large and handsome. The houses generally have not much architectural merit, but many buildings, both private and public, are well deserving of notice. Among the latter are the Duomo or cathedral, partly Romanesque and partly Gothic, in the form of a Latin cross, with a fine octagon tower and dome in the centre, the interior of which was painted in fresco by Correggio; the baptistery, dating from the thirteenth century, cased with Verona marble, and covered in its front with curious bass-reliefs; the church of La Steccata; the monastery and church of San Giovanni, the latter containing some of the finest, though unfortunately faded, frescoes of Correggio; the church of the Annunciata, also enriched by paintings of Correggio; besides many other churches containing paintings by Correggio, Mazzuoli, and Lanfranco, who were born here. Other buildings and places of interest are the ducal palace, the Teatro Farnese, the Museo delle Antichità, the royal library, and the Academy and Gallery of the Fine Arts; the governor's palace, the town-house, and the famed ducal printing-office, known to bibliographers as the 'Bodoni Press,' &c. The manufactures are of silk, cottons, woollens, earthenware, &c. There are also several silk-mills, tanneries, dye-works, and paper-mills. Parma claims to be of Etruscan origin, though in the first notice of it it is spoken of as a Roman colony. Pop. in 1881, 44,494. The province of Parma lies on the right bank of the Po, between the provinces of Piacenza, Massa e Carrara, and Reggio, and has an area of 1253 square miles, and a population of 277,293. It is watered chiefly by the Taro, the Parma, and the Enza, all of which fall into the Po. It is covered by branches of the Apennines on the south. See next article.

PARMA, Duchy of, formerly an independent state of Upper Italy, but since 1860 incorporated in the Kingdom of Italy, and divided into the provinces of Parma and Piacenza. It comprehended the three duchies of Parma proper, Placentia or Piacenza, and

Guastalla, with the small principality of Landi, and was bounded on the north by Lombardy, west by Cremona, south by Tuscany, and east by Modena; the area being 2766 square miles. The district lies wholly between the Apennines and the Po. The loftiest mountains lie in the Apennine chain. The Alpe di Succiso attains a height of 6807 feet; Orsaio, 6180; Penna, 5860; and Regola, 5773. The principal rivers after the Po are the Bardinezza, Tidone, Trebbia, Taro, and the Parma. The climate is on the whole temperate; the air pure and healthy, with the exception of the districts near the Po, where the atmosphere is impregnated with noxious vapours. Agriculture is the chief source of wealth of the inhabitants, the soil being remarkably fertile and the art of husbandry well understood. Manufactures are in a backward state; they include, however, silk, linen, and cotton goods, paper, gunpowder, and earthenware.

Before Parma was incorporated into the Kingdom of Italy the government was an absolute monarchy, hereditary in the main line. All power, legislative and executive, resided in the sovereign, who appointed all public functionaries, and governed by a ministry accountable only to himself. The laws consisted of a code promulgated in 1820, nearly the same as the Code Napoléon, though not without several modifications.

Parma anciently formed part of Gallia Cispadana and Liguria. After undergoing various vicissitudes during the decline of the Roman Empire it became part of the Kingdom of Lombardy. Charlemagne having conquered that kingdom, made a present of Parma to the pope, who long possessed it. In the subsequent quarrels between the popes and the emperors both Parma and Piacenza became independent republics. In 1512 Pope Julius II. regained possession; and in 1543 Paul III. erected them into a duchy in favour of his son Luigi Farnese, whose line became extinct in 1731. Don Carlos, son of Philip V. of Spain and Elizabeth Farnese, obtained possession in the face of a protest by the pope, and kept it till 1736, when he became King of the Two Sicilies. A claim was now put in by Austria; but the Treaty of Aix-la-Chapelle in 1748 gave possession to Philip, another son of Philip V. and Elizabeth Farnese. The victories of the French in Italy in the beginning of this century enabled Napoleon to seize the duchy and attach it to his Kingdom of Italy under the name of the department of the Taro. After Napoleon's downfall it fell to the Archduchess Marie Louisa for life, and thereafter to the Duke of Lucca. Pop. 256,029.

PARMEGIANO. See MAZZOLA

PARMENIDES, a distinguished Greek philosopher, head of the Eleatic school, was a native of Elea in Italy, and flourished about the middle of the fifth century B.C. In 450 he went to Athens, accompanied by his pupil Zeno, and there became acquainted with Socrates, then quite a young man. He was held in high esteem by both Plato and Aristotle, not only for the depth of his intellect, but for the earnestness and sublimity of his character; and such was the respect in which he was held by his fellow-citizens that every year they bound their magistrates to render obedience to the laws which he had enacted for them. Like Xenophanes he developed his philosophy in a didactic poem On Nature, of which numerous fragments are still extant. In the first part of the poem he treats of that which *is*, of absolute being which reason alone is able to conceive and demonstrate; and in the second part of that which *appears*, of the phenomena of the senses. Pure being he opposes to all that is multiplex and mutable, as well as to non-being, and excludes from the notion of it the elements of time and space, origination and decease, identifying it finally with thought. Being cannot be predicated of the phenomenal world, which is illusion. The second part of his poem begins with the remark that truth's discourse and thought are now ended, and mortal opinion only remains to be considered. What still exists of this second part being very fragmentary and incomplete, little can be gathered from it of his views as a whole regarding the phenomenal world. There is, however, perceptible an inconsistency between the first and second parts of the poem, for what in the former he directly denies, and even declares incapable of being spoken, the multiplex and the mutable, this he in the latter grants as at least existing in human perception. The principle of unity for which Parmenides contends is preserved, according to him, in the view that body and soul are one and the same. The best editions of the fragments of Parmenides' poem are to be found in Karsten's Philosophorum græcorum veterum operum reliquiæ (Amsterdam, 1835), and in Müller's Philosophorum Græcorum fragmenta (Paris, 1860).

PARMESAN CHEESE. See LODI.

PARNAHIBA, a river of Brazil, which rises in the west slope of the Serra-da-Tabatinga, in the north-east of the province of Goyaz, flows north-east, forms the boundary between the provinces of Piauhi and Maranhão, and falls into the Atlantic below Parnahiba; lat. 2° 50′ S.; lon. 41° 20′ W.; total course, about 800 miles, of which about 600 miles are navigable. The main entrance at its mouth is about 7 miles wide, and has never less than 5 to 7 fathoms water. Its chief affluents on the right are the Uruçuhi, Gorguea, Piauhi, Sambillo, and Longa, and on the left the Balsas.

PARNASSUS, or LIAKHURA, now called ZAGORA, a mountain of Northern Greece, on the borders of the nome of Attica and Bœotia and that of Phthiotis and Phocis, 65 miles north-west of Athens. It forms part of the Hellenic chain which separates the waters of the Ionian Sea from those of the Archipelago, and attains the height of 8858 feet. Parnassus was in classic times the fabled haunt of the Muses, and possessed, among other celebrated spots, the Castalian Spring and the oracle of Delphi. The site of Delphi, on the south side of the mountain, is now occupied by the small town of Castri.

PARNELL, THOMAS, a distinguished poet, was born in Dublin in 1679. He was educated at Trinity College, and taking orders in 1705, was presented to the archdeaconry of Clogher. He was connected with Addison, Congreve, Steele, and other Whigs in power; but towards the latter part of Queen Anne's reign, when the Tories became triumphant, he deserted his former friends, and linked himself with Swift, Pope, Gay, and Arbuthnot. He afforded Pope some assistance in his translation of Homer, and wrote the Life prefixed to it. By Swift's recommendation he obtained a prebend in the Dublin Cathedral and the valuable living of Finglass. The latter years of his life were clouded by sorrow. He had married a lady who was distinguished alike for her beauty and her merit; and her premature death in 1712, after a happy union of several years, was a great blow to the poet. To drown his grief he fell into habits of intemperance, which had the effect of shortening his life. He died in 1717. A collection of his poems was published by Pope in 1721. They are pleasing, and possess fancy, ease, sprightliness, and melody of versification; while their sentiments are elegant and morality pure. Another posthumous volume was published at Dublin in 1758, but its authenticity is doubted.

PAROCHIAL BOARD, in Scotland, a board appointed in each parish for the administration of affairs relating to the relief of the poor.

PARODY. The Greeks gave this name to humorous poems, or to parts of them, in which whole passages or single expressions were taken from serious compositions. Athenæus has preserved a poem of this kind by Matron, and calls Hipponax the inventor; but according to Aristotle Hegemon of Thasus invented them. Aristophanes is full of such parodies. By *parody* at present is generally meant a composition in which a serious composition has been transformed by changing its subject into another, either serious or comic, most commonly the latter, while it still retains the form and as near as may be the words of the original. Parody also means a poem in which merely the chief personages and ideas are changed, the subordinate parts and the whole tone being preserved. The Battle of the Frogs and Mice (Batrachomyomachia), ascribed to Homer, is a good specimen of this kind of composition. The French are noted for their indulgence in parody: a whole catalogue might be cited of dramatic pieces which they have parodied. Contrast is the chief instrument of parody, and as mere contrast, by exciting surprise, often produces for a time the effect of wit, poor parodies often please for a moment by boldness in applying the gravest expressions to the most comic subjects, or the reverse.

PAROLE, a term signifying anything done verbally or by word of mouth, in contradistinction to what is written; thus an agreement may be by parole. Evidence also may be divided into *parole* evidence and *written* evidence. See EVIDENCE.

In military affairs, when a prisoner of war receives full liberty within certain limits on promising not to attempt to escape he is said to be *on his paro'e;* or he may get leave to depart from custody on promising that he will return at the time appointed; or he may give his parole not to fight again during the continuance of the war. Breach of parole is reckoned infamous in all civilized nations.

PAROS, an island in the Grecian Archipelago, one of the Cyclades, 4 miles west of Naxia; length, north-east to south-west, 13 miles; breadth, 10 miles on the north, where it is indented by two deep bays between which the land projects and forms a peninsula. It is generally mountainous; but the soil, though often rocky, is fertile, and in some places well cultivated, yielding much corn, wine, fruit, and cotton; great numbers of sheep, goats, and swine are reared. Its marble was extensively worked in ancient times, and is the material of which some of the most celebrated pieces of statuary are composed, among others the Medicean Venus and the Dying Gladiator. Parekhia, a wretched place, occupies the site of the ancient Paros. Pop. 8000. Paros was the birthplace of Phidias and Praxiteles, and contains a celebrated grotto or cave full of fine stalactites. It was said to have been originally inhabited by Cretans and Arcadians; but at a very early period it was colonized by Ionians, under whom it prospered greatly. It subsequently, however, became subject to Athens.

PAROTID GLANDS. See SALIVARY GLANDS.

PARQUETRY, inlaid wood-work, generally used for floors. The designs are geometric patterns executed in two differently-tinted woods. See MARQUETRY.

PARR, CATHARINE. See CATHARINE PARR.

PARR, SAMUEL, a learned divine and eminent critic, was the son of an apothecary of Harrow, in Middlesex, where he was born in 1747. At the age of six he was admitted into the celebrated school of his native place, which he headed in his fourteenth year. In 1765 he entered Emmanuel College, Cambridge, which, however, he was obliged to quit soon afterwards, being deprived of the means of support by the death of his father, and accepted the situation of usher at Harrow. In 1769 he entered into deacon's orders, and in 1771 was created A.M. at Cambridge by royal mandate for the purpose of qualifying him to succeed Dr. Sumner in the mastership of Harrow school; but not succeeding, he opened a school at Stanmore, and in 1776 became master of the grammar-school at Colchester, whence, in 1778, he removed to take charge of that of Norwich. In 1783 he obtained the perpetual curacy of Hatton in Warwickshire, where he afterwards resided, and was presented by Bishop Lowth to a prebend in the cathedral of St. Paul. In 1802 Sir Francis Burdett presented him to the valuable living of Graffnam, in the county of Huntingdon. Dr. Parr commenced his career as an author in 1760 by the publication of Two Sermons on Education; and in the following year printed a Discourse on the Late Fast, which, in consequence of its allusion to the contest with America, excited great attention. In 1787 he assisted his friend Henry Homer in a new edition of the learned Scotsman William Bellenden (Bellendenus). This republication he inscribed to the three political associates, Fox, Burke, and North, the character of whose oratory he drew with uncommon elegance, force, and felicity. Making use of the same opportunity to assail that of their political opponents, he put an end to all hopes of preferment from government, on which account a subscription was made by the Whig Club, which secured him an annuity of £300 per annum. In 1789 he republished the Tracts by Warburton and a Warburtonian, to which he prefixed some severe strictures on Bishop Hurd. In 1790 he engaged in the controversy on the real authorship of White's Bampton Lectures, from which it appeared that his own share in them was by no means inconsiderable. In 1791 his residence was in danger of destruction from the Birmingham rioters in consequence of his intimacy with Dr. Priestley. On this occasion he published a tract entitled A Letter from Irenopolis to the Inhabitants of Eleutheropolis. On Easter Tuesday, 1800, he preached his celebrated Spital sermon, in which he attacked the social doctrine of Godwin's Political Justice. This discourse he soon after published, with notes. His death took place at Hatton, March 26, 1825, in his seventy-ninth year. In curious and elegant classical knowledge he seems to have been at the head of the English scholars of his day. His prodigious memory and extent of research rendered him very powerful as a conversationalist, which seems to have been the principal cause of the high reputation he enjoyed; for to the modern reader his writings will hardly justify that reputation. His Works, with a Memoir by Johnson, appeared in eight vols. 8vo (London, 1828); and Memoirs of Dr. Parr, &c., by Field (two vols. 8vo, 1828).

PARRAKEET, or PAROQUET. See PARAKEET.

PARRHASIUS, a Greek painter, born at Ephesus, flourished about 420 B.C. He was a contemporary and rival of Zeuxis. According to Pliny he was the first who introduced proportion into painting, lively expression and grace into the countenance and attitude, and he excelled all other painters in design. Several of his pictures are mentioned by ancient authors, but none of them has been preserved. One of the most celebrated is an allegorical representation of the Athenian *demos*. His success rendered him arrogant; according to Athenæus he clothed himself in purple, wore a gold wreath on his head, and pretended to be descended from Apollo, one of whose surnames was Parrhasius.

PARROT (*Psittacus*), the type of a family (Psittacidæ) of Scansorial or Climbing Birds, the members of which are distinguished by the large size and

arched form of the upper mandible, which terminates in an acute point overhanging the shorter lower mandible. The sides of the movable upper mandible are frequently serrated or cut into teeth-like processes. The nostrils are situated in the *cere*, at the base of the mandible. The tarsi are short and of strong make; the toes, as in all the Climbing Birds, being arranged two forwards and two directed backwards—a disposition fitting the feet admirably for climbing. The two front toes are united at their bases by membrane, the under toes being free. The bill also aids these birds greatly in their peculiar mode of locomotion. The wings are of moderate size; but the tail is elongated, and in some instances assists these birds in climbing. The tongue, unlike that of most other birds, is soft and fleshy throughout its entire extent, and thus serves presumably more as an organ of taste than, as in other birds, as a tactile organ. The Parrots are very generally distributed over the warm and tropical regions of the world, and several hundreds of species are included in the family, which is divided into several distinct sub-families. The food consists of seeds and fruits; these birds breaking open the hard husks of nuts, &c., by aid of their beaks, with great ease and dexterity. The Parrots are monogamous in habits, the nests being constructed in the holes of rocks or trees.

The Owl-Parrot of New Zealand (*Strigops habroptilus*) forms the sole representative of the first sub-family, that of the *Strigopinæ*. This bird is nocturnal in habits, and constructs its nest in holes of trees. The wings are rudimentary, and it is chiefly terrestrial in habits. The eggs number two or three. The true Parrots (*Psittacinæ*) possess no head-crests, and the sides of the bill are toothed or serrated. In this sub-family are included the most celebrated and familiar members of the parrot-group. The Gray Parrot (*Psittacus erythacus*) of Western Africa is the best-known species, and also the form which acquires the power of talking in greatest degree. The extent to which these birds can not only imitate the various tones of the human voice, but also exercise in some cases actual conversational powers, forms one of the most striking phases of instinct among the lower animals. These parrots grow exceedingly docile, and may live to a great age, instances being on record of these birds attaining an age of seventy or more years. The Green Parrots are chiefly American in their distribution, a familiar form being the Amazonian Parrot (*P. Amazonicus*). This bird is coloured a bright green, and possesses a blue strip across the forehead; whilst the cheeks, tips of the wings, and throat may be coloured red or yellow. It chiefly inhabits the Orinoco territory, but extends southwards on the continent. The Lories (*Lorinæ*) form another group of the Psittacidæ, and possess a bill of more slender make than the preceding forms, with a wavy or sinuous margin. The tail and wings are shortened, the former being pointed or of rounded shape. The plumage is brilliantly coloured. These birds inhabit the Eastern Archipelago chiefly. The tongue in many of the Lories is provided with terminal bristles, supposed to be of use to these birds in sucking up the flower-juices, which, together with the soft pulps of fruits, form their chief food. See also LORY.

The Macaws (which see) constitute the sub-family *Arainæ*. These forms are characterized by the large size of the bill, by the large convex upper mandible, which projects downwards in a curved manner over the short lower mandible; by the elongated tail, and by the cheeks being usually naked. These birds belong exclusively to tropical America.

The genus *Psittacara*, represented by the *P. Guianensis*, or Guiana Parroquet, and the *Conurus Carolinensis*, or Carolina Parroquet, appear to connect the Parrots with the Macaws. The head in these forms is completely covered with feathers, and they are of smaller size than the Macaws, to which, in brilliancy of plumage and in general appearance they present a close resemblance. They speak with great distinctness, a feature not possessed by the Macaws. The Carolina Parroquet is the only species of the parrots occurring in North America. Its furthest northern boundary is at Lake Michigan, lat. 42° N., the most southern boundary of the parrot family being the 52d parallel. The favourite food of the Carolina Parroquets consists of the seeds of the cockle-bur, which grows in great abundance along the shores of the Mississippi and the Ohio. They are seen in large flocks screaming round the salt-licks, being, like the pigeons, fond of the salt water. They are very sociable in their dispositions, extremely fond of each other, and showing the greatest grief for the loss of their companions. The plumage is very beautiful, the general colour being a bright-yellowish, silky green, with light-blue reflections. The tail is long and cuneiform. These birds are about 13 inches long and 21 across the wings when extended. The Guiana Parroquet is said to be exceedingly destructive to the coffee plantations.

The last sub-family is that of the *Cacatuinæ* or Cockatoos. The head in these forms possesses an erectile crest of feathers, and the tail is broad and short. They inhabit Australia and the islands of the Eastern Archipelago. The food consists of seeds and fruit. The voice is generally harsh, and although they may be taught to speak well if taken young, their linguistic accomplishments are never of so high an order as those of the Parrots. The nests are formed in the holes of trees. The great and small Sulphur-crested Cockatoos (*Cacatua* or *Plyctolophus galerita* and *sulphurea*) are familiar forms, the latter being found in the Molucca Islands and the former occurring in Australia. The genus *Calyptorhynchus* of Australia includes many large and brilliant species, of which the Banksian Cockatoo (*C. Banksii*) is a well-known form. The Galeated Cockatoo (*Callocephalon galeatum*) is also a familiar member of the group. The Lorikeets (*Trichoglossus*) of Australia, and the Love-birds—which see (*Agapornis*), may also be mentioned as concluding the list of the principal genera of this large family. (See Pl. CXL.–CXLI. figs. 1–6.)

PARROT-FISH (*Scarus*), a genus of Teleostean fishes included in the sub-order Acanthopteri, and in the section Pharyngognathi of that division. The inferior pharyngeal bones are usually ossified together, so as to form a single bone; and this is generally armed with teeth in the fishes of this section. The Parrot-fishes included in the family of the Wrasses (Labridæ) present a peculiarity of structure, in that their jaws are hard, and are shaped like the beak of a parrot. The jaws are further composed of numerous small teeth which are closely aggregated together on the jaw-bones, so as to present a uniform and beak-like conformation. As the jaws and their 'denticles' or small investing teeth are worn through these fishes feeding on the hard coral polypes, they are renewed by the upward growth of the bone and teeth of the lower jaw, and by the downward growth of the structures of the upper jaw. Pyloric cæca are wanting in these fishes, and the fourth branchial or gill-arch has only a single series of gill-laminæ or leaflets. These fishes chiefly occur in the seas of the tropics.

PARRY, SIR WILLIAM EDWARD, a distinguished Arctic navigator, was born at Bath on 19th December, 1790, and was the son of a physician of some eminence. He was educated at the grammar-school of his native town, and originally intended to follow his father's profession, but an aunt of his, Miss Corn-

PARSON, in English ecclesiastical law, is the rector or incumbent of a parish; also, in a wider sense, one that has a parochial charge or cure of souls. He is called parson (Latin, *persona*) because the church, which is invisible, is represented in his person. A parson differs from a vicar in his having in himself for life the freehold of the parsonage house, the glebe, tithes, and other ecclesiastical dues; while in the case of the vicar, the right in these being vested in the appropriator, he usually receives only a portion of the ecclesiastical dues. The vicar is in effect perpetual curate to the appropriator, with a stated stipend. The modes of becoming parson and vicar are the same, there being in both cases four requisites, namely: holy orders, presentation, institution, and induction. No one can be a parson, nor indeed be eligible for any benefice, unless he has first been ordained a priest, when he is called a clerk in orders, and must have attained the age of twenty-four. The duties of a parson are principally of ecclesiastical cognizance, such as performing divine service in the parish church, administering the sacraments to parishioners, &c. A parson ceases to be such in one or other of the following ways besides death: by *cession*, in taking another benefice; by *consecration*, on promotion to a bishopric, when all other preferments become void; by *resignation*, but only when accepted by the ordinary; and lastly by *deprivation*, for heresy, infidelity, gross immorality, or other crimes.

PARSONSTOWN, formerly called BIRR, a market town in King's County, Ireland, on a gentle acclivity on both banks of the Lower Brosna, 69 miles W.S.W. of Dublin. The modern parts are well built and regularly laid out in streets and squares. In one of the squares near the centre of the town there is a low Doric pillar with a statue of the Duke of Cumberland, the victor of Culloden, erected in 1747, and a fine bronze of William, third Earl of Rosse. The only buildings of note are the Episcopal church and the Roman Catholic chapel. There are also Presbyterian, Methodist, and Quaker meeting-houses; a fever hospital, dispensary, schools, union workhouse, &c. About a mile from the town is a fine military barracks capable of accommodating 1000 infantry. A trade in corn is carried on, and there are a distillery and brewery. Birr Castle, the seat of the Earl of Rosse, closely adjoins the town, and has obtained a European celebrity from the reflecting telescope manufactured and erected by the late earl, which is the largest and most powerful hitherto constructed. Pop. in 1871, 4939; in 1881, 4955.

PARTERRE denotes the open part of a garden laid out in the old French style, or the plot in front of the mansion laid out according to a regular plan, and adorned with closely shaven grass and flowers. In a theatre the French *parterre* is synonymous with our *pit*, or the space between the boxes or amphitheatre and the orchestra. In this space the spectators originally stood, though it is now provided with seats, and the fate of any piece depended on the reception which it got from the occupiers of the parterre.

PARTHENOGENESIS (Greek, *parthenos*, a virgin; *genesis*, birth). Professor Owen's term, applied to express those cases in which new individuals are produced from the ova or eggs of females, without impregnation by the male animal. The term is also occasionally employed, although less correctly, to denote an asexual mode of reproduction—such as those exemplified by the Zoophytes, Infusoria, &c.—namely, *gemmation* or 'budding,' and *fission*, or simple division of the body-substance. Limiting the term to the apparent production of individuals by virgin females without the fertilizing influence of the male, we find several notable examples of such peculiar phenomena among insects. But the exact meaning and bearings of the subject should at the outset be clearly borne in mind. The ovum of the female, in an ordinary and strictly normal sense, requires to be impregnated by the male element before the characteristic changes and actions of development—and the consequent production of a new being—can be inaugurated and set in operation. The contact of the male and female elements constitutes, in fact, the one and essential feature in the act of true or sexual reproduction; and hence, when the series of phenomena included under the term parthenogenesis was first brought to light, and new individuals were thus said to be produced from *unimpregnated* ova, the statement and discovery excited no small amount of curiosity and surprise.

The *Aphides* or Plant-lice, insects belonging to the Hemipterous order of insects, and which are found in immense quantities on the leaves of plants, present notable examples of the phenomena of parthenogenesis. Bonnet's researches on these forms have placed a vast store of information at our disposal, and the chief facts in the developmental history of the Aphides may be briefly enumerated. Whilst the investigations of Von Siebold on the development and reproduction of bees have similarly made us aware of interesting parthenogenetic phenomena in these insects.

In autumn the female Aphides, impregnated by the male Aphides, produce true and ordinary ova or eggs, which are deposited in the axils of the leaves and on the branches of plants. These fertilized ova lie throughout the ensuing winter season without exhibiting any apparent progress or development. They are developed, however, in the following spring, and all the ova invariably produce *female* Aphides only. These females—regarded by some naturalists as *neuters* or sexless individuals (see NEUTER), or as *hermaphrodites*—are wingless, and are provided each with six feet. These wingless, or 'virgin females' as they are termed, in a *viviparous* manner, and without the presence of or access to any male, produce a second generation resembling themselves in the wingless condition, and in the absence of males. And in this way each succeeding generation may produce another brood, similar to itself—the process continuing in some cases through nine, ten, or eleven generations. Bonnet thus traced the reproduction of the 'fruitful virgins' through nine, and Duvau through eleven generations. And Kyber observed the same process extending over a period of four years, without being able to demonstrate the presence of a single male insect.

On the approach of the succeeding autumn, however, *winged males* make their appearance in the final generation or brood of the 'fruitful virgins.' These males copulate with the females also produced in the brood, and impregnated eggs are thus produced. These eggs lie dormant through the autumn, and repeat in the succeeding spring the curious and anomalous reproductive history of their predecessors. The multiplication of the Aphides, it may be noted, is of a very remarkable kind, so far as the fecundity of the insects is concerned. In five generations, according to Reaumur, the viviparous mode of reproduction may give origin to 5,904,900,000, forms, as the descendants of one Aphis. In a single year as many as twenty generations may in some cases be produced.

We have thus presented to us the details of a pure and simple case—so far as the mere details are concerned—of parthenogenesis. In other words, the presumably virgin females produce 'eggs,' and these without impregnation by the male develop into new and similar forms, which in turn repeat the

process in their own history. In considering the bearings of the subject certain obvious points demand preliminary explanation or notice. Can the ova or eggs of the fruitful virgins be thus considered, or are they, in fact, true ova; and as such do they correspond to the ova of other animals, which invariably require impregnation to inaugurate their development? If so, then we are forced to admit that the most vital rule of sexual reproduction—the invariable presence of male and female elements—can thus be set aside or is thus violated.

Or, secondly, may we not assume that the male influence originally impregnating the first brood may be transmitted in its essential part, or *materies*, through the successive broods of virgin females; and that in this way the great condition of sexual reproduction may be maintained, although in a manner different from that in which it is generally and commonly fulfilled? Or, thirdly, may it not be maintained with some show of reason, that the eggs from which the progeny of the virgin females is produced are not true ova, but analogous in their nature to *gemmæ* or 'buds;' and that consequently the process is not one of strict parthenogenesis, but merely one of an asexual form of reproduction—namely, *gemmation* or 'budding'? According to the latter view—that of Quatrefages—the so-called ova of the fruitful virgins are *pseudova* or 'false-eggs,' and resemble 'buds' in their essential nature. Or, lastly, can the views of Balbiani be supported—this latter observer arguing that the virgin Aphides are in reality *hermaphrodite*, each possessing united male and female reproductive organs? In the latter view the whole phenomena are simplified and all mystery done away with, since the process would be merely one of simple sexual generation occurring in hermaphrodite or monœcious forms—countless examples of which occur throughout both animal and plant worlds.

With regard to the first query, concerning the exact structural nature of the ova of the virgin Aphides, the opinions of naturalists are much divided; and this first point can more reasonably and logically be debated in connection with either the second or third queries. Thus if we hold them to be truly ova, then the second explanation or suggestion therein contained will assist our views. If we deny them to be eggs in the true sense of the term, the third suggestion will meet and support this latter opinion. The essential parts or structures seen in the eggs of all animal forms are detailed in the article OVUM. These are the outer wall or *vitelline membrane;* the *vitellus* or yolk; the *germ vesicle*, and *germ-spot*. Such a disposition of parts is invariably present in the ovum of every animal without exception. And such an ovum, so far as experience has yet taught us, requires impregnation by the male for its development to form a new being.

Huxley and Lubbock consider the ova or reproductive bodies of Aphides to be true eggs, whilst Quatrefages, as already mentioned, denies this statement. The question is, therefore, still *sub judice*, and on its final settlement depends the solution of the parthenogenetic mystery—in so far, at least, as to whether we are to consider the phenomena those of pure parthenogenesis, or merely one of asexual reproduction.

The second suggestion introduces us to a definite view of the subject, based on the assumption, or proceeding on the belief that the ova of the virgin-aphides are true or ovarian eggs. This explanation leads us, therefore, to consider the case one of pure parthenogenesis; or to explain the occurrence of the development of ovarian ova without the essential or actual presence of the male. Professor Owen's views, expressed under this form, would imply that the male element is potentially represented, although not actually present. According to this opinion, the fertilizing effects or power of the original stock of the male element, or *spermatic force*—given to the female Aphides by the males in autumn, and through which the first or impregnated ova are produced—are retained and transmitted from generation to generation, and serve for the impregnation of the ova of the so-called virgin-females, without necessitating the actual presence of fresh or actual males. An original store of spermatic elements is thus provided, according to the theory, in which store generation after generation participates, through the transmission of the potential principle of the male influence. Owen thus says that so much spermatic or male force is 'inherited by the retained germ-cells from the parent cell or germ-vesicle as suffices to set on foot and maintain the same series of formative actions as those which constituted the individual containing them.' And as might reasonably be urged or inferred, 'every successive generation, or series of spontaneous fissions, of the primary impregnated germ-cell must weaken the spermatic force transmitted to such successive generations of cells.'

Such opinions necessitate the adoption of certain views regarding the essential nature of the impregnating force or medium derived from the male. We have to assume or argue for, either, firstly, the transmission of *actual* and *absolute* male elements from each generation of females to the succeeding generation; or secondly, the transmission of the *abstract*, subjective, or potential principle of the impregnating force. The first suggestion, advocating the transmission of the actual *material* of the male force is hardly a feasible one; but as regards the second point, the case assumes a more likely and rational aspect. We do not as yet know anything definite regarding the essential part of the male reproductive act or influence upon the female ovum. What it is in the male element that constitutes the essential and necessary part of the impregnating force, fluid, or act, is still unknown to physiological science. And in this avowed ignorance we cannot reasonably or logically argue against the presumed transmission of an abstract or potential principle; or deny that the impregnating influence of the male may not or cannot be transmitted, like other conditions and traits of the living organism. The theory thus enunciated has a definite bearing. It is to be noted that it is a pure hypothesis, incapable in the present state of our knowledge of verification, and of so being received into the domain of true fact. But it is worthy of remembrance—if it does merely fit the facts as they stand—as a creditable explanation of a phenomenon seemingly inexplicable, according to more realistic and experimental ideas.

The opinion that the reproductive bodies of the virgin-aphides are not true eggs offers another mode of explaining away the theoretical difficulties which beset the subject. They have thus been termed *pseudova*, and have been considered to be merely internal *gemmæ* or buds. The process of gemmation or budding, both external and internal, occurs in many groups of the animal world. It forms the most common mode of reproduction among the Zoophytes, (Cœlenterata), Sea-mats (see MOLLUSCA and POLYZOA), corals, and other organisms. Hence the virgin-aphides are supposed to possess the power of internally producing gemmæ or buds, which escape from their bodies as the generations of fruitful virgins. The structural and homological relations of ova and buds present many points of connection and similarity; and it may be conceded that primarily the ovum and the bud stand on a structural basis common to both.

throne, and in 229 subjected all Central Asia, and founded the line of the Sassanides. See PERSIA.

PARTICIPLE (Latin, *participium*), that part of a verb which has the nature of the adjective, with this addition, that it expresses also the relations of time, the present, past, &c. This double nature gave the participle its name, *participating*, as it does, of the characters of two parts of speech. In English there are two participles, the present and the past, the former, except in irregular verbs, ending in *ing*, and the latter in *ed*. Care must be taken to distinguish the present participle from the verbal substantive in *ing*, which is exactly equivalent to the infinitive, with this advantage, that it can be construed as a noun. In the two sentences, 'I am writing,' and 'Writing is irksome,' we have an illustration of the two significations of 'writing;' in the former it is a participle and in the latter a verbal substantive. Many languages have active and passive participles, past, present, and future. The beauty of a language, its force and expressiveness, depend greatly upon the perfection of its participles. The modern European languages are very deficient in this respect compared with the two classical languages.

PARTICK, a populous police burgh of Scotland, in the county of Lanark, on the Kelvin near its confluence with the Clyde, adjoining Glasgow on the west. It has two Established, three Free, three United Presbyterian, and other churches; an academy, and several schools; flour-mills, and cotton factories; and in and near it are bleachfields, shipbuilding yards, &c. It forms a suburb of Glasgow, many of whose citizens reside here, and for whose accommodation numerous handsome and picturesquely situated villas have been erected. Pop. (1881), 27,394.

PARTICLES (*particulæ*), such parts of speech as are incapable of any inflection, as, for instance, the preposition, conjunction, &c. These words are generally short, consisting mostly of original sounds, and the name *particles* has been given to them from this circumstance; but as the external dimension of a word is a very unphilosophical and insufficient ground of classification many grammarians have dropped this name and divided all parts of speech into declinable and indeclinable.

PARTITION, (1) in law, is a dividing of lands descended by the common law or custom among coheirs or parceners where there are two at the least.—2. A thin wall in the interior of a building separating one apartment from another; it is usually of brick, but not unfrequently of wood or other material.

PARTNERSHIP. A partnership is an agreement between two or more to share in the profit and loss of the use and application of their capital, labour, and skill in some lawful business, whether one supplies capital and another skill and labour or each contributes both labour and capital. The benefits of a union of the means and advantages of different persons for the conduct of a branch of business in many instances are too obvious and common to need illustration. A community of profit between the parties is the true criterion of a partnership, for one partner may stipulate to be free from loss, and this stipulation would be effectual as between himself and his partners, though he would be liable equally with them to third parties. As to the share of each partner in the profits or his liability for losses, if there is no agreement on this subject all the partners stand upon an equal footing. As to the objects of copartnerships, they are not confined to commerce, though most frequent in that branch of industry, but may embrace manufacturing, the carrying on of any mechanic art, agriculture, the practice of law or of medicine, and, in short, almost every lawful branch of business. Private partnerships are contracted by the mere consent of the parties, no charter or license being necessary. A partner who is a minor is entitled to all the benefits, although not liable to any of the losses of the partnership; but if on attaining his majority he do not disaffirm the partnership he is responsible in contracts subsequently made by the firm.

Copartnership is more usually formed by a written agreement. This is not a general rule, however, for in many branches of business parties may agree orally on a participation in profit and loss.

Copartnerships are usually confined to the prosecution of a particular branch of business, and it very often happens that each copartner is concerned in other branches. The term *general copartnership* is applied to one formed for trade generally, or business generally, without limitations. A partnership is called *special* when the parties enter into stipulations modifying and restraining the powers and rights of the members instead of leaving them to the operation of the laws generally applicable to such associations. Each partner has a joint interest in the whole personal property, and unless the articles stipulate otherwise may transfer it. Each partner may also bind the whole firm by his contract made in the course of the business of the firm unless it be otherwise agreed between them. And even when it is otherwise agreed, still, if a party with whom a partner contracts has a legal right, from the manner in which the joint affairs are managed, to presume that a partner is authorized to contract for and bind his copartners in regard to the subject of any contract, the firm will be bound by such contract. But if the party contracted with has notice that by the articles of copartnership a partner has not authority to make a contract, the company will not be bound by it. So if a partner contracts in the partnership name in a matter which the party contracted with knows is not within the business of the firm—as if he makes a negotiable note in the name of the firm for his own separate debt—the contract will not bind the firm to the party thus contracted with; but still, if this contract, being transferable in its nature, and holding out on the face of it the responsibility of the whole firm, is negotiated to those who have no notice that the paper was made for the private accommodation of the partner who signed the partnership name, the company will be bound in respect to such assignee; that is, the firm having given notice to the world that they are copartners in a certain branch of business, every one has a right to presume that all acts done by each of them in regard to it are authorized by the terms of their contract or the circumstances of the case, unless he has notice to the contrary. But certain acts are not authorized by the general powers of copartners, and those no one partner can be presumed to have power to do, as, for instance, one partner is not, merely as such, authorized to make a deed in the name of the other or to act as his attorney; and he cannot, accordingly, convey land belonging to the members of the company, for though it may have been acquired and paid for with the property of the firm, yet when acquired it belongs to the members in common if the title be in them all, and each member can himself convey only his share; and in order to the conveyance of that of another he must be specially empowered. But a partner may release a debt due to the firm if it be done fairly, and without collusion between him and the debtor. Partners are usually divided into three classes—*ostensible*, *nominal*, and *dormant*. An ostensible partner is one whose name is made known, who is really a partner, and appears so to the world; a nominal partner, on the other hand, is one who has no actual interest in the busi-

an adjective, while the interjection can hardly be said to belong to articulate speech at all. Each of the parts of speech will be found separately treated under their several heads throughout the work.

PARTY-WALL, is the wall that separates two houses from one another. Such a wall, together with the land upon which it stands, belongs equally to the landlords of the two tenements, half belonging to the one and half to the other; and unless the wall has stood for twenty or more years, each can legally do what he likes with his own half, even to cutting it away. It is a common practice for the party who builds a house adjoining another to pay half the expense of the wall to the owner of that other; in Scotland he may compel him to grant him half the wall on paying half the expense, but in England compulsion is not admissible.

PASCAGOULA, a river of Mississippi, which runs south into the Gulf of Mexico, 38 miles west of Mobile Bay; lon. 88° 30′ w. It is navigable for vessels drawing 6 feet of water about 50 miles. Length, about 300 miles.

PASCAL, Blaise, a distinguished French philosopher and mathematician, was born at Clermont, in Auvergne, on June 19, 1623. He was the only son of Étienne Pascal, the president of the *cour des aides*, who educated him with great care, and instructed him himself. In early youth he gave proofs of extraordinary talents, and showed a decided inclination for geometry; but his father, being desirous that he should concentrate all his attention upon the study of languages, withheld from him all mathematical books. Notwithstanding this and similar precautions young Pascal, now in his twelfth year, devoted himself in his hours of relaxation to the statement and demonstration of geometrical problems, independent of all aid from books. His father one day surprised him at his favourite study, and finding that the bias of his mind lay so decidedly in the direction of mathematics, instead of putting any further obstructions in his way, did all in his power to facilitate his progress in that study. So rapid was his advance that while yet in his sixteenth year he wrote a treatise on conic sections, displaying great acuteness, but which, notwithstanding the entreaties of his friends, he would not consent to publish. His studies in languages, logic, physics, and philosophy were pursued with such assiduity that his health was irrecoverably gone in his eighteenth year. In the course of the next year (1647) he invented the calculating machine, the mechanism of which it cost him much pains to render intelligible to the workmen, when he was hardly free from suffering for a day. In his twenty-third year he made several discoveries concerning the Torricellian vacuum. Before he was twenty-four the reading of some religious works, particularly those of the Jansenists, had brought him to the conviction that a Christian must eschew science as a lust of the flesh and devote himself to God only. He therefore laid aside all profane studies, and became more and more deeply rooted in his ascetic notions. Pascal's piety produced a great effect on his family. His father became his pupil, and his sister a nun in Port Royal. Although constantly sick, he continued to practise his penances with additional rigour. By the direction of his physician he went into society; but his sister soon induced him to renounce all intercourse with the world, and to give up all superfluities, even at the expense of his health. In this manner he lived from his thirtieth year till his death. After spending some time in a monastery he retired to an estate in the country, denied himself every indulgence, made his own bed, ate in the kitchen, and allowed himself to be served only when it was indispensably necessary. He spent his time in prayer and in reading the Scriptures. His disease meanwhile became aggravated, and he died in 1662, at the age of thirty-nine. He had conceived a work on the Christian religion, the object of which was to show its excellence, from a consideration of human nature as well as on historical grounds. The fragments, which were written down during the last four years of his life, and published under the title of Pensées sur la Religion (Amsterdam, 1667), show the hand of a master. His Provinciales, ou Lettres écrites par Louis de Montalte à un Provincial de ses Amis, is a most bitter satire upon the lax morality of the Jesuits, whose influence was more affected by it than by the most violent attacks of their declared enemies. These letters are esteemed a model of the didactic epistolary style in French literature. The Pensées and Lettres Provinciales have been several times translated into English.

PASCHALIS, the name of three popes:—Paschalis I., pope from 817 to 824, was obliged to undergo an imperial inquest in consequence of his having put out the eyes and then cut off the heads of two Roman ecclesiastics who had espoused the cause of Lotharius. The assertion that St. Louis conferred upon him the temporal supremacy of Rome is a fiction of the eleventh century.—Paschalis II., pope from 1099 to 1118, showed more forbearance towards Philip of France and Henry of England than towards the emperor Henry IV., but was compelled by his son, Henry V., whom he had formerly stirred up against his father, to give him investiture as emperor, and to end his life in exile.—Paschalis III. was chosen pope in 1164 by the cardinals in the interest of the emperor, and in consequence became a rival pope to Alexander III., but is not recognized by the Romish Church as legitimate. One of his acts was to canonize Charlemagne.

PAS-DE-CALAIS, a department of France, bounded north by Dover Strait, west by the English Channel, south by the department of Somme, east and north-east by the department of Nord; length, 88 miles; mean breadth, 34 miles; area, 2512 square miles, five-sixths of which are cultivable. Its coast, extending about 80 miles, presents a long tract of low sand-hills, but near Boulogne forms a lofty crumbling cliff, continually preyed on by the waves; the interior is generally flat, and furnishes great facilities for canals, of which there are several; the streams, too, though short, are generally navigable. The principal harbours are Boulogne and Calais. The climate of the department is mild, but somewhat inconstant. The soil, though marshy in several places, is usually very fertile, and produces, besides cereal and leguminous, large oleaginous crops. The chief minerals are indifferent coal, good pipe and potter's clay, and excellent sandstone. There are numerous iron-foundries, glass-works, potteries, tanneries, bleach-works, mills, and factories of all kinds. There are six arrondissements—Arras, Béthune, Boulogne, Montreuil, St. Omer, and St. Pol; the capital is Arras. Pop. in 1881, 819,022.

PASEWALK, a walled town of Prussia, in the government of Stettin, and 27 miles west by north of the town of that name; situated on the right bank of the Ucker. It has a court of law, two churches, and two hospitals. Iron-founding, starch, tobacco, and other manufactures are carried on. It is an ancient place, and formed one of the towns of the Hanseatic League. In 1760 the Prussians were defeated here by the Swedes. Pop. 9469.

PASHA, or Pacha (said to be derived from the Persian *pa*, foot or support, and *shah*, sovereign), a title belonging to Turkish military commanders of high rank and the governors of provinces. It is merely an honorary title, and was originally bestowed

only on princes of the blood, but was eventually conferred upon the grand vizier, the members of the divân, the seraskier (commander-in-chief), the capitan-pasha (minister of marine), the begler-begs (bey of beys), and other civil and military functionaries. The distinctive badge of the pasha is the horse-tail waving from the end of a lance, crowned with a gold or silver ball. This badge is carried before them when they take the field during war; before the doors of their houses is placed one, two, or three gold or silver globes surmounted by a pink and white plume. The three grades of pashas are distinguished by the number of horse-tails or globes, three being allotted to the highest dignitaries, all of whom have also the title of vizier. The pashas of two tails are generally the governors of the more important provinces; the lowest rank, of one tail, is generally filled by the sanjaks or minor provincial governors. The pasha is military chief and administrator of justice in his province, and holds office during the sultan's pleasure. Their power was formerly absolute within their jurisdiction, and was often arbitrarily exercised, but has now been somewhat restricted. Should the growing power or wealth of a pasha excite the fears or the cupidity of the sultan, the unfortunate functionary is quickly removed, and frequently by the hands of the executioner, and his property, often the fruit of extortion, confiscated.

PASIPHAE, in heathen mythology, daughter of Helios and Perseis, and wife of Minos, king of Crete, to whom she bore Deucalion, Glaucus, Ariadne, and Phædra. Blinded by Poseidon, who wished to punish Minos for not having sacrificed a bull to him, or, according to others, by Aphrodite, who had sworn vengeance against the whole family of Helios because he had betrayed her intrigue with Ares, she was inflamed with an unnatural love for the bull. Her desires were gratified by means of the wooden animal made by the ingenious Dædalus, and the Minotaur was the fruit.

PASQUIL. See PASQUINADE.

PASQUINADE, a lampoon or short satirical publication, deriving its name from Pasquino, a tailor who lived about the close of the fifteenth century in Rome, and who was so much celebrated for his caustic satire and wit that his shop was much visited by persons desirous to hear him. Soon after his death a beautiful but mutilated statue (according to some, that of Menelaus) was dug up not far from Pasquino's shop, and put up in a corner of the Braschi Palace. The people unanimously called the statue *Pasquino*, and satirical placards were attached to it—put, as it were, into the mouth of the revived Pasquino. Another statue, called *Marforio* (which see), stood opposite Pasquino; and questions were generally attached during the night to Marforio, which were answered by Pasquino. For instance, Pope Sixtus V. had taxed several articles of food, and on Sunday Pasquino appeared with a wet shirt, as if to dry it in the sun. Marforio inquired why he did not wait till the next day to dry his shirt; to which Pasquino replied, 'I am afraid to lose any time, for to-morrow I may have to pay a tax for sunshine.' The practice of affixing placards to the statue has only recently been discontinued. The Italian words *pasquinata* and *pasquillo* have been adopted in several other languages to denote a stinging satirical broadside or tract, and in some, as French and German, are even used in legal language for libel.

PASSAGE, BIRDS OF. See MIGRATION.

PASSAGE, WEST, a small seaport town of Ireland, in the county of Cork, and 6 miles S.S.E. of the city of that name, with which it is connected by railway. It is important chiefly as a watering-place, and as being the marine suburb and shipping port of Cork. It consists of one principal street, extending along the shore for nearly a mile, with other smaller ones diverging from it; there is a quay, also a dockyard, and very elegant pier. The chief trade is ship-building and unloading vessels of above 400 tons burden, that cannot proceed up the river. Pop. (1881), 2440.

PASSANT, in heraldry, a term applied to a lion or other animal in a shield, appearing to walk leisurely, looking straight before him, so that he is seen in profile; when the full face is shown the term *passant gardant* is employed; and when the head is turned fairly round, as if the animal were looking behind, it is *passant regardant*.

PASSAROWITZ, PEACE OF, concluded July 21, 1718, by Venice and the Emperor Charles VI. with the Porte at Passarowitz, a small town in Servia, at the confluence of the Morawa and the Danube, under the mediation of Britain and Holland. It terminated the war begun in 1714 by the Porte for the conquest of the Morea, in which the Turks succeeded in 1715. The emperor, as guarantee of the Peace of Carlowitz, took up arms for Venice in 1716. Eugène was victorious at Peterwardein, August 15, 1716, and at Belgrade, August 16, 1717; after which the Porte determined to conclude a peace on the principle of *uti possidetis*, by which it retained the Morea, without a formal cession from Venice. Austria received Belgrade, with Servia, the banat of Temeswar, Walachia to the Alute, and part of Croatia.

PASSAU, a town of Lower Bavaria, in a defile shut in by high mountains and beetling precipices, at the confluence of the Ilz, Inn, and Danube, 91 miles E.N.E. of Munich. It stands on the south-east frontier of the kingdom, and is a place of great consequence, being strongly fortified both by nature and art. It consists of four parts—Passau proper, built in the form of a triangle on the tongue of land between the right bank of the Danube and the left bank of the Inn; Innstadt, on the right bank of the Inn; Anger, a suburb on the left bank of the Danube, adjoining it Oberhaus, a fort strongly situated on a height 417 feet above the river; and Ilzstadt, also on the left bank of the Danube, but likewise traversed by the Ilz. These parts communicate with each other by bridges across the Danube and the Inn, which are here nearly of equal magnitude. It contains few buildings of much interest; the principal are the cathedral, a handsome modern structure in the Italian style, with a bell-shaped cupola; the bishop's palace; church of St. Michael; the Jesuit College, now converted into a lyceum; the town-house, gymnasium, library, theatre, assembly-rooms, industrial school, lunatic asylum, infirmary, and several hospitals. The manufactures consist of iron, copper, and earthen ware, porcelain, crucibles, tobacco and snuff-boxes. There are also several extensive breweries. The trade embraces a considerable number of articles, but the most important are wood, salt, and grain. Passau is the see of a bishop, and possesses several provincial and city courts and offices. It is famous for the treaty signed in it in 1552, when Charles V., intimidated by the victories of Maurice of Saxony, was compelled to do justice to the Protestants, and secure them in a full toleration. Pop. (1881), 15,365.

PASSENGER PIGEON (*Ectopistes migratorius*), a species of the Columbidæ or Pigeon family found in North America, and so named from its migratory habits, these birds, although common over the entire continent, yet passing from one part to another in immense flocks. Its chief *habitat* appears to lie in the central part of North America, between the Rocky Mountain chain and the Atlantic Ocean. Its size averages that of the common pigeon of Britain.

The tail, however, is much longer than in its more familiar neighbours, and is of conical or wedge-shape. The lateral or side feathers of the tail are coloured white, those of the middle being of blackish-brown hue. Two eggs of a fine white colour form the brood, and each brood is said to consist of a male and female. Wilson formerly believed that one egg only was laid in each brood.

From the graphic descriptions of Audubon and Wilson much interesting information regarding the immense numbers of those pigeons which form the migratory flocks may be obtained. Audubon (basing his calculation on the supposition that the flock of pigeons, 1 mile in breadth, and moving at the rate of 1 mile per minute, occupies three hours in passing a certain fixed point) says that his calculations give a parallelogram of pigeons of 180 square miles in extent. And allowing two pigeons to each square yard the flock would thus comprise 1,115,000,000 pigeons. An ordinary pigeon, it is further calculated, would consume half a pint of grain daily as food, an estimate which gives 8,712,000 bushels as the daily quantity of food required to feed the foregoing flock. These enormous numbers do not appear to be a whit exaggerated from the actual details of the case. Wilson similarly calculated that a flock observed by him was 240 miles long, and numbered 2,230,272,000 pigeons, whilst the food-supply was estimated at 17,424,000 bushels of grain per diem. These immense flocks are said to literally darken the air, and the birds composing them are killed by thousands. A scene of devastation is generally left behind such a migratory body. The rate at which these pigeons travel has been calculated from the fact that passenger pigeons have been killed near New York with their crops containing undigested rice, which could not have been obtained nearer than Georgia and Carolina. These rice-fields are distant 300 to 400 miles from New York, and as the pigeons digest their food in about twelve hours they may be safely calculated to have flown the above distance in about six hours, thus travelling at the rate of nearly 1 mile per minute.

The powers of flight possessed by these birds are very great. Instances are on record where the passenger pigeon has been found as solitary specimens in Britain, having presumably crossed the intervening ocean. The nests are built on trees in large numbers, each nest being constructed of sticks and straws slightly fastened together. The females appear to build the nest. The male brings the materials, and is described as alighting on the female's back so as to avoid disarranging the already-formed portion of the nest. Both the male and female perform the work of incubation.

PASSENGERS, persons conveyed from one place to another for hire. The law regarding passengers in a public conveyance by land may be briefly set down as follows:—Railway and other public companies of carriers contract to carry passengers without any negligence on their (the carriers') part. In case of accident it lies on the carrier to show that it was from no fault or negligence on his part that the accident occurred. Railway companies are responsible for the misconduct of their employés, the state of their lines, carriages, &c.; hence all passengers injured (or in case of death their nearest relatives) have a claim for compensation, unless it can be proved that the accident was due to the fault of the passenger. Railway companies are not legally bound to provide carriage accommodation for everybody who offers himself, but merely to provide for the ordinary number. Passengers have a right to carry along with them without extra charge a certain quantity of luggage, which must, however, consist of wearing apparel or articles for personal use, and not of goods intended for sale. Passengers by sea are carried subject to the same general law as those by land: the carriers are bound to observe all due precautions to prevent accident or delay. By the act of 1863 (26 and 27 Vict. cap. li.) a passenger vessel is defined to be every description of sea-going vessel, British or foreign, carrying fifty passengers, or greater number than in the proportion of one adult to every 33 tons of registered tonnage if propelled by sails, or than one adult to every 20 tons if propelled by steam. No passenger ship having fifty persons on board, and the computed voyage exceeding eighty days by sailing vessels, or forty-five by steamers; or having one hundred persons on board, whatever the length of the voyage, and not bound to North America, can proceed on its voyage without a duly qualified medical practitioner on board. Ships going to North America, and allowing 14 instead of 12 feet of superficial space to each passenger, may clear without a medical practitioner, but no vessel must clear without a medical man if the passengers exceed 300. The provisions must be according to a certain scale of diet. The passage-money must be prepaid; but the owners are not obliged to convey steerage passengers by the vessel contracted for; the vessel substituted must, however, be equally convenient and seaworthy, and the members of families must not be separated. In the case of imminent danger from tempest or enemies passengers may be called upon by the master or commander of the ship to lend their assistance for the general safety, and in the event of their declining they may be punished for disobedience. A passenger is not bound to remain on board in the hour of danger, but may leave the ship if he have an opportunity. Emigrant vessels must be inspected by the officers appointed by the board of trade, who are to grant a certificate of their fitness for carrying such passengers. Passenger steamers must be surveyed at least once every year.

PASSERES. See INSESSORES.

PASSING-BELL, the bell rung in Catholic countries at the hour of a person's death to obtain the people's prayers for the dying in their hour of agony. The custom of tolling a bell while the soul is supposed to be 'passing' from earth is as old in England as the days of the Venerable Bede, who tells us that at the death of St. Thilda, one of the sisters of a distant monastery, as she was sleeping, thought she heard the sound of the bell which called them to prayers when any of them departed this life.

PASSION FLOWER (*Passiflora*), a beautiful genus of climbing-plants, containing numerous species, remarkable for the elegance and singular form of their flowers. The genus has obtained its name from the fancied resemblance of the parts of the flower to the instruments of our Saviour's passion. The stems are woody, or more frequently herbaceous, provided with tendrils, and bearing alternate simple or lobed leaves; the flowers are axillary, and supported on peduncles; the calyx is widely-spreading, and divided into ten parts, the five interior of which have the form of petals, or are sometimes wanting. Botanists are not agreed as to the nature of the floral envelopes of the passion flowers. Jussieu and De Candolle were of opinion that the parts taken for petals are only inner divisions of the calyx; whilst Lindley and others maintain that the outer series of the floral envelopes are the calyx and the inner the corolla. To the base of the calyx is attached an interior crown, composed of a great number of filaments. There are five stamens (monadelphous) surrounding the stalk of the ovary. The fruit is a large one-celled berry, often indeed approaching a gourd in size, containing numerous seeds, and in many

species is edible, though not rich in flavour. The water-lemon of the West Indies (*P. laurifolia*) bears fruit as large as a hen's egg, containing a whitish watery pulp, which has a peculiar aromatic, delicately-acid flavour, and allays thirst agreeably.—The sweet calabash of the same countries (*P. maliformis*) has the fruit of the size of an apple, inclosing a sweetish pulp. Granadilla is the name given to the fruit of several species, including *P. quadrangularis*, *P. edulis*, and *P. incarnata*. The syrup and decoction of the flowers of several species, also natives of the West Indies, are used as a narcotic.

PASSIONISTS, a congregation of priests of the Roman Catholic Church, founded in 1737 by Paul Francis of Danni, otherwise called Paolo della Croce (born 1684, at Ovada, Piedmont; died 1775, at Rome), for the purpose of instilling into men's minds by preaching, devotional exercises, and example, a sense of God's mercy and love as manifested in the passion of our Lord. The members of the congregation practise many austerities; they go barefooted, rise at midnight to recite the canonical hours in the church, &c. Wherever they are invited by the local clergy they hold missions, preaching sermons on the sufferings of Christ, on sin and repentance, and receive the confessions of the penitent. The constitution has only risen into prominent notice within the last fifty years; and new houses have sprung up in Britain, Belgium, America, and Australia. The founder was beatified by Pius IX. in 1853.

PASSION OF CHRIST, the crucifixion of Jesus, with all its attendant sufferings. It is celebrated in the Catholic and most Protestant churches on the European continent during Lent (the seven weeks preceding Easter), and particularly during the Passion-week (the week preceding Easter), by sermons relating to the sufferings of the Saviour. In Rome the celebration of the Passion-week in the Capella Sistina is famous on account of the incomparable music in the papal chapel. There the compositions of Palestrina, Pergolesi, Allegri, and others are heard in the purest style. The Officium Hebdomadis Sanctæ juxta Formam Missalis et Breviarii Romani sub Urbano VIII. contains the rites of worship in the Passion-week prescribed by the Catholic Church. The passion of Christ formed the subject of the first theatrical representations, which were prepared by the clergy, and thus, strange as it may seem, became the origin of the modern theatre. See articles MYSTERIES and DRAMA.

PASSION-WEEK. See PASSION OF CHRIST.

PASSOVER (Hebrew, *pasach*, a sparing, a passing over), the Jewish feast in commemoration of the sparing of the Israelites when the first-born of the Egyptians perished, and of their escape out of Egypt. It was celebrated on the first full moon of the spring, from the 14th to the 21st of the month Nizan. (See EASTER.) To this festival, as long as the Israelites remained in possession of Palestine, they assembled originally at the tabernacle, and from Solomon's time at the temple. During the eight days of the feast they were permitted to eat only unleavened bread, because their hasty departure from Egypt had obliged them to take their dough with them before it was leavened; hence the passover was also called the 'feast of unleavened bread.' Every householder, with his family, ate, on the first evening, a lamb, which was served up without breaking the bones. Thanksgiving, and the relation of incidents from the history of the Exodus, gave this festival its religious character. Offerings of firstlings of the flocks and herds, and first-fruits, were also presented in the temple. The passover was the principal Jewish annual festival, and is still observed by the Jews, by eating unleavened bread and by public prayers.

PASSPORT, a warrant of protection and permission to travel granted by a competent authority to persons moving from place to place. In some European states no person is allowed to leave the country without a passport from his government giving him liberty to do so; and passports are even required by the natives when they travel from one part of the country to another. In Britain and in the United States the internal passport system has no existence, and the only species known to English or American travellers is foreign passports. The French government allow British subjects to enter and leave France without passports, but travellers from the south and east are said sometimes to have had to procure them. The system is now abolished in Austria, Belgium, Denmark, Germany, Holland, Italy, Norway, Sweden, and Switzerland; passports are still necessary in Greece and Portugal, and in Russia, Turkey, and Egypt the counter-signature of the minister or consul of the country which the traveller is to visit is rigorously insisted on. It is occasionally of advantage to be provided with a passport in countries where it is not demanded, as it furnishes a proof of the bearer's identity and nationality. In Britain passports are granted by the foreign secretary to persons recommended to him by persons known to him, or on the production of an application signed in the applicant's favour by a British banking firm, or a certificate of identity signed by a mayor, magistrate, justice of the peace, minister of religion, doctor, solicitor, or notary resident in the kingdom. If the applicant be a naturalized British subject his certificate of naturalization must be sent to the foreign office. Passports may be given for goods as well as for persons; and in time of war a ship's passport is a voucher of her neutral character.

PASSY, a suburb of Paris included within the line of fortifications, and since 1860 incorporated with the city. Its vicinity to the Bois de Boulogne and the river renders it peculiarly interesting. There are here mineral springs, which are resorted to for the cure of dyspepsia, chlorosis, &c. See PARIS.

PASTA, GIUDITTA, one of the famous operatic singers of the present century, was born at Como, near Milan, in 1798, of Jewish parents. She commenced her musical studies at Como, under the chapel-master of the cathedral of her native town, whence she proceeded, at the age of fifteen, to the Milan Conservatoire, which she left at the end of three years. She appeared in some of the second-rate theatres of Northern Italy, in 1816 in Paris, and the following year in London, without achieving anything more than a moderate success. From the first, and in some measure all through her musical career, her voice (a powerful mezzo-soprano) wanted that softness and flexibility looked for in an Italian cantatrice. Disappointed with the coldness of her reception, she returned to Italy and resumed the study of her art, and resolved in future to trust more to her dramatic than her vocal talent. During the years 1819–22 her reputation steadily increased, and in 1823 she conquered success in Paris in the presence of her mighty rival Malibran. In 1824 she reappeared in London, and was received with great enthusiasm. Up till 1833 she held one of the foremost places on the lyric stage, which she then quitted and retired to a villa she possessed near the Lake of Como. In 1840 she was tempted by splendid offers to appear at St. Petersburg; but her magnificent organ had lost its power to charm, and she abandoned the stage for ever. She died at Milan in 1865. She was specially distinguished in the tragic opera; Bellini wrote for her his Norma and Sonnambula, and she made the roles of Medea, Desdemona, and Semiramide absolutely her own.

PASTE, a glass made in imitation of gems. This glass contains a large amount of oxide of lead, sometimes as much as 50 or 55 per cent.; it has high refractive powers. A little borax is added, in order to render the glass hard. Arsenic is also sometimes added. The colours are imparted by the addition of small quantities of metallic oxides. The fusion should be continued in a potter's furnace for twenty-four hours; Hessian crucibles are better than those of porcelain. The more tranquil and continued the fusion, the denser the paste and the greater its beauty.

Pastes.	1.	2.	3.	4.
Rock-crystal,	4056 grs.	—	3456	3600
Minium,	6300 ,,	—	5328	—
Potash,	2154 ,,	1220	1944	1260
Borax,	276 ,,	360	216	360
Arsenic,	12 ,,	12	6	—
Ceruse of Clichy,	—	8508	—	8508
Sand,	—	3600	—	—

Topaz.	No. 1.	No. 2.
Very white paste,	1008	3456
Glass of antimony,	43	—
Cassius' purple,	1	—
Peroxide of iron,	—	36

Ruby: paste 2880, oxide of manganese 72.—*Emerald:* paste 4608, green oxide of copper 42, oxide of chrome 2.—*Sapphire:* paste 4608, oxide of cobalt 68, fused for thirty hours.—*Amethyst:* paste 4608, oxide of manganese 36, oxide of cobalt 24, purple of cassius 1.—*Beryl:* paste 3456, glass of antimony 24, oxide of cobalt 1½.—*Styrian garnet:* paste 502, glass of antimony 256, cassius' purple 2, and oxide of manganese 2. This art has recently been carried to great perfection, and specimens exhibited at the Great Exhibition could scarcely be distinguished from real gems.

PASTEL, or PASTIL, a kind of paste composed of several colours, and ground up with gum-water, either together or separately, in order to make crayons to paint with on paper or parchment. (See CRAYONS.) This kind of painting possesses some advantages over the modes more commonly practised. Its great defect is its want of durability.

PASTON LETTERS, THE, a valuable collection of letters written by and to members of the Paston family in Norfolk during the period of the wars of the Roses, four volumes of which were published by Mr. (afterwards Sir) John Fenn, and a fifth by his literary executor Sergeant Frere (London, 1787–89 and 1823). The letters are written in the freest and most communicative manner, and lay open all the domestic affairs, the interests in public movements, the intriguing at elections, and the lawsuits of this particular family, and all the relations of English popular life in the period in which they were written. Their interest and historical importance have been recognized by Horace Walpole, Hallam, and other authorities. The authenticity of these letters was called in question by Herman Merivale in the Fortnightly Review for September 1, 1865; but at a meeting of the Antiquarian Society on December 1, at which he was present, fresh documents and originals of unpublished letters were produced, and he abandoned his position. An excellent edition of the whole, including many previously unpublished letters, has been brought out under the editorship of Mr. James Gairdner (among the works belonging to Mr. Edward Arber's reprints), being complete in three vols.

PASTORAL is the general name of those poems which represent men in the simplicity and innocence in which they are thought to have lived before the origin of civic relations, and the vices thence resulting. When we look back in imagination to an original state of man we naturally refer it to a shepherd's life, since feeding flocks and tilling the ground were the first occupations of man, and are older than civil society. As the first strains of poetry must have been heard in the primitive times of the human race, and as a shepherd's life is congenial with this mode of occupation, we naturally consider poetry as having originated in the pastoral period. The wonders of nature, which lay every moment before the shepherd's eyes, must have kindled in his breast poetic fire. The pastoral proper, however, as a peculiar style of poetry, had its origin in a more complicated and corrupt state of society, on account of the desire of men for a better and more natural state of life. There have been both epic and dramatic pastorals. To the epic belong the pastoral romances of ancient and modern poets; also the Luise of Voss, and the Erwin and Elmire of Goethe, &c., and, in a more limited sense, the greater part of the idyls of Theocritus, and his imitator Virgil. Among the dramatic are Guarini's Pastor Fido, Ramsay's Gentle Shepherd, and several other modern pieces, to which may be added the *satyrica* of the Greeks. The greater part of the bucolics or eclogues of the ancients and moderns are lyric. The pastoral must show a world in which nature alone gives laws. Restrained by no civil customs, by no arbitrary rules of politeness, men must there give themselves up to the impressions of nature. They know no wants but those which nature imposes, and no blessings but the gifts which she bestows. Their principal passion is love, but love without restraint, without dissimulation, without Platonic sublimity. Their arts are bodily exercises, singing, and dancing; their riches fruitful flocks; their utensils a shepherd's crook, a flute, and a cup. There are also allegoric idyls, among which are the first and tenth eclogues of Virgil, the idyls of Madame Deshoulières, &c. The principal writer of idyls among the ancients was Theocritus, who has likewise represented the most simple relations of city life. He was followed by Bion and Moschus. Pope has imitated Virgil in four pastorals; Gay wrote six charming pastorals, entitled the Shepherd's Week, teeming with honest rustic humour and pictures of genuine English country life. Burns' Cottar's Saturday Night is a deservedly well-known specimen of the pastoral poem.

PASTORALE, in music, a rural composition of an idyllic character; also a composition for a dance in this character, generally in six-eighth or twelve-eighth time.

PASTORAL LETTERS, are circulars addressed by a bishop to the clergy or laity under his jurisdiction at certain stated times or on special occasions for purposes of religious instruction or admonition in matters of discipline. Such are the letters issued by the bishops at many of the church festivals, and such, too, are the Lenten Mandates of the Roman Catholic Church, issued immediately before Lent, containing the regulations laid down for the observance of the fast, the dispensations granted, &c. Pastoral letters are issued in cases of particular emergency, when danger to the faith or morals is apprehended, on the occasion of some prevalent abuse or scandal, or daring attack on the church.

PASTORAL THEOLOGY, or PASTORALE, is used to designate that part of theology which includes the execution of the duties of the clergyman, the application of his theological knowledge—the practical part of theology. It is also called *pastoral science, pastoral wisdom,* or *pastoral prudence.* But the latter, the *prudentia pastoralis,* more frequently includes only certain rules of prudence which experience has shown to be important for the execution of clerical duties. According to the widest meaning of the pastorale, it is to be divided into as many heads

as there are branches of the official duties of a divine. In respect to his office as teacher, it comprises, therefore—1, pulpit eloquence; 2, catechesis; 3, liturgics, in its widest sense, the administration of the sacraments, the service at the altar and before the congregation; 4, everything which is necessary for a clergyman to know as the adviser, comforter, and leader of his flock, the duties of the confessional, the consolation of the sick and sorrowful, the preparation of the sick and the condemned criminal for death, and everything which is requisite for the maintenance of church discipline, so that with Catholics the chief part of the canon law is comprised in it. Catholics call, also, the official collection of all the ceremonies attached to the administration of the sacraments, and the other public duties of the clergyman, the pastorale. It is pretty much the same as that which is better known under the name of *Rituale Romanum*, except that this has received the papal revision and confirmation. Thus the pastorale of the Roman Catholic is a written code, while that of the Protestant minister consists of principles addressed merely to his understanding.

PASTRY, articles of food made of paste or dough, or of which paste forms a principal ingredient. Several varieties are prepared for different purposes, of which the following are the principal. The finest sort, called puff paste, is rather difficult to make well, requiring a light hand to knead the ingredients together without unnecessarily working them, the use of perfectly dry flour, and of butter free from water or buttermilk; the operations must be conducted in a cool apartment, and the paste should be made upon a cool marble slab. For a rich puff paste take 1 lb. of flour and 4 oz. of dry fresh butter, with just a sufficient quantity of cold water to make a good stiff flexible dough; roll out with a rolling pin and spread ½ lb. of butter over it. It must be then rolled up, and lightly kneaded to work in the butter. The thinner it is rolled out before the butter is spread the better, as when it is put into the oven (which must be a moderately quick one), the laminæ which have been formed by folding up the butter with the dough separate, by the disengagement of the elastic vapour, which causes the mass to swell up and to form an assemblage of thin flakes, each separated from the other, and the thinner these flakes the better the paste. Short paste or short crust may be made of 1 lb. of flour, 2 oz. of pounded sugar, 6 oz. of butter, one egg, half a teaspoonful of salt, and half a pint of water; mix the sugar and butter well together, add them with the water by degrees to the flour, and form a firmer paste than puff paste. For pies or baked puddings the upper crust is generally made of puff paste, and the remainder of short paste. For boiled puddings the paste may be ordinary short paste, or one made with 2 to 6 oz. of butter or lard, or 3 to 8 oz. of chopped beef suet to each lb. of flour, with or without an egg and a little sugar. The first is best for fresh fruit, and that with suet for meat puddings, and those containing dried fruit. Milk mixed or unmixed with water is often used to make the dough, and the crust is often flavoured with ginger, spices, &c.

PASTURES, land under grass and herbage, which is eaten as it grows by horses, oxen, sheep, and other herbivorous animals. Hill pasture is a term applied to hilly or mountainous lands kept perpetually under their natural grasses and herbage, whilst artificial pastures are produced by sowing on lands which are occasionally subjected to the plough. On the uplands of Great Britain, where grain crops cannot be profitably cultivated, and in some of the most fertile plains and valleys of England and Ireland, there are large tracts which have been under grass for hundreds of years. These permanent pastures are computed to cover 14,000,000 acres in England, 9,000,000 in Ireland, and 8,000,000 in Scotland. The common grasses on British pastures are different species of meadow grass, fescue, foxtail, oat grass, cocksfoot, rye-grass, hair-grass, vernal-grass, and cat's-tail or Timothy, with different kinds of clover. Pastures may be divided into bullock lands and sheep lands, the former including all the best grazing grounds. First-class pastures are those which will feed a hundred-stone ox per acre, while those which will scarcely feed a seventy-stone ox come under the second class. In the early part of winter the land should be cleared of stock in order to insure a good pasturage in spring, about the end of April or the beginning of May the field should be stocked, the cattle being in a thriving condition so as to be speedily ready for the market. The pasture must be kept in what is called a feeding state, that is, sufficiently long to be easily cropped by the ox. As the herbage increases, more stock must be added, and in luxuriant seasons horses may be added in the proportion of one to about 7 acres. Stocking partially with sheep on the best bullock land should be avoided, as the sheep pick out much of the fine growing grasses, leaving the coarser for the cattle; horses generally graze on the short barer places of the field. They must be removed whenever the pasture betokens decline in the summer. It is now a common practice to give fattening cattle a daily allowance of linseed cake (say of 4 lbs.) upon their pasture; this not only accelerates the fattening process, but allows the land to carry a larger proportion of stock. The droppings of the cattle should be repeatedly broken up and spread, and it is a good practice to mow some rough portions of the field every day; this will keep the pasture even, materially improving the herbage of the rough spots, and when the herbage is very rank, the cattle will readily eat up the partially dried grass thus mown. A dressing of lime and salt spread over these rough places in autumn will sweeten the herbage, and induce the cattle to eat it down regularly. Moss, a great disadvantage in many pastures, may be got rid of by penning sheep, well supplied with swedes, corn, or cake, regularly over the field; or by harrowing the surface in different directions in January and February, then applying a top dressing of soil or dung, and in March or April sowing clover or other seeds, firmed down by the bush harrow, clod-crusher, or heavy roller. Draining in many cases is resorted to with advantage. Thistles, nettles and docks are injurious, and should be eradicated as soon as possible. Milch cows certainly require good pasture, but if put on really good bullock land they will incline rather to fatten than to yield much creamy milk. Very lean animals, whether oxen or sheep, should not be placed at once on rich pasture, but should be gradually fitted for it. Young steers may be placed among young sheep on the inferior pastures; calves must be put upon the sweetest and most healthy fields. When fat stock has been sent to market, the land should be heavily stocked with store cattle and sheep, so as to feed the whole off in the shortest possible time; it may then be cleared of stock for a time to obtain grass for a second stocking. The better class of sheep pastures feed four to seven sheep per acre, according to their breed, size, age, and aptitude to feed. The sheep should be kept on turnips or similar food as late in the spring as possible, and then placed upon their pasture. On the grass beginning to take a decided lead, young cattle may also be placed upon it at the rate of one for every five acres; whenever the herbage declines they must be removed. When grass begins to fail in the autumn the sheep should be supplied on the land with

cabbages, turnip, corn, or cake. All pastures should be completely eaten off at some period between Midsummer and Michaelmas, so that no old grass may remain for the winter.

PATAGIUM (Latin, the border or skirt of a dress), the name applied to the expansion of the skin or integumentary membrane by means of which bats, flying squirrels, flying lizards, and other semi-aerial forms support themselves in the air. The extinct reptiles known as Pterodactyls also supported themselves in the air by means of a membrane of this kind. The *Draco volans*, or Flying Dragon of the East Indies, thus exemplifies a little living lizard in which a flying membrane is supported upon certain of the front or false ribs. This membrane, as in other cases, cannot, however, be viewed as a true wing or organ of flight, since its use is merely to serve as a kind of parachute, which is adapted temporarily to support its possessor in the air whilst it takes flying leaps from tree to tree.

In the Pterodactyls (which see) a large patagium or flying membrane existed, and was supported by the outermost finger only, this digit, however, being very greatly elongated, and the patagium thence extending along the sides of the body between the fore and hind limbs. In the Flying Phalangers or *Petauri* of Australia, marsupial animals related to the Kangaroos, &c., a patagium or fold of skin extends between the fore and hind limbs along each side of the body. This membrane serves merely, as in the Flying Dragons, to temporarily support the animals in the air. In the Flying Squirrels (*Pteromys sciuropterus*), belonging to the Rodent order of mammals, a similar disposition of the skin is seen. These latter are found in Southern Asia, Polynesia, in the north-east of Europe, and in North America. The patagium of the Bats is chiefly borne by the four greatly elongated fingers of the hand, the thumb being small and free. It extends between the fore and hind limbs, and frequently unites the hind limbs and tail. By aid of this more perfectly developed structure the Bats are enabled to take more extensive flights than the preceding forms. The Flying Lemurs or Galeopithecidæ possess a patagium extending from the neck to the fore limbs, from these to the hind limbs, and between the latter and the tail. This membrane in the Flying Lemurs simply acts as a parachute, and not as a true organ of flight.

PATAGONIA, the extreme southern portion of the continent of South America, extending from the Rio-Negro, lat. 39° s., to the Strait of Magellan lat. 53° s., 970 miles, with a breadth varying from 420 to 200 miles; area, 350,000 square miles. It comprises two climatically distinct regions, the one lying on the west side of the Andes (claimed by Chili), the other on the east (claimed by the Argentine Republic), and called respectively Eastern and Western Patagonia. The latter comprehends a number of large islands, extending from the western extremity of the Strait of Magellan to Cape Tres Montes, lat. 47° s. The principal are the islands Adelaide, Hanover, and Wellington, the last 150 miles long, and in some places 60 miles broad. All these islands are rocky and high, rising from the shores with a steep acclivity. The coasts which front the Pacific are bare, being almost continually washed by rains, and beaten by violent winds; but those parts which lie opposite the mainland are wooded, and in some places the trees are high, and of vigorous growth. Eastern Patagonia has not been thoroughly explored, but the recent travels of Captain G. C. Musters have furnished us with some reliable information. The surface consists chiefly of high undulating plains, often intersected by valleys and ravines, or rising into isolated or successive hills, which mainly occupy the crest of the country. The plains are here and there covered with rank grass, but more frequently they are strewn with huge boulders, or the surface is broken by ridges of bare, sharp-edged rocks, many of them of volcanic origin; elsewhere there is nothing to be seen but bare patches of clay or gravel, interspersed with clumps of thistles and stunted bushes. In numerous places the soil is impregnated with saltpetre, and there are many salt lakes and lagoons. Except pasture, Eastern Patagonia has no productions; and although there is a large, fertile and picturesque tract along the base of the Andes it is not cultivated, the natives preferring to live on the spoils of the chase. The principal rivers are the Rio Negro, the Chupat, the Rio Desire and the Rio Chico, all having their source in the Andes and running east or south-east. The ports on the east coast are difficult of access, and afford little security to any but small vessels. The tides here rise from 30 to 50 feet, increasing in height south. The principal known ports are Gallegos, lat. 51° 35′ s.; Port Santa Cruz, lat. 50° 7′ s.; Port San Julian, lat. 49° 12′ s.; Port Desire, lat. 47° 5′ s.; Nueto Gulf, lat. 43° s.; and Port St. Antonio, lat. 41° s. Herds of horses are reared, and in the more fertile districts cattle are bred; dogs abound, and pumas and foxes are met with, as are also condors, hawks, partridges and water-fowl. The more important animals, however, are the guanaco, the Patagonian ostrich (the *Rhea Darwinii*), and a kind of deer called gama. Fish and seals abound on the coasts. The climate is extremely cold, especially south of 45°. Piercing blasts, chiefly from the west, sweep almost incessantly over the country, and snow, sleet and rain seem to prevail during the greater part of the year.

The inhabitants call themselves Ahonicanka or Tchonek, but are more generally known by the name of Tehuelches or Tehuels, which is given them by their neighbours the Araucanians. They are divided into two tribes, northern and southern; the former inhabit the district between the Andes and the Atlantic, from the Rio Negro to the Chupat, and even as far as the Santa Cruz; the rest of the country is occupied by the southern tribe, a taller and finer race, and more skilful hunters. The language of both tribes seems to be the same, the chief difference being that of accent. The two races are much intermixed and intermarriages are frequent. The stature of the Patagonians, about which so many exaggerated reports were formerly current, appears to range in the males from about 5 feet 10 inches to 6 feet 4 inches, in the females some 6 inches less. They are well proportioned, with well-developed chest and muscular arms; are first-rate swimmers and pedestrians, walking two or three days without being fatigued. Their eyes are bright and intelligent, their noses aquiline and well-formed, and their foreheads open and prominent, the expression of their faces is ordinarily good-humoured, except in the settlements. The complexion of the males, when cleaned from paint, is of a reddish brown; that of the females, more especially the young, is of a healthy ruddy hue. The young women are often good-looking, reach the age of puberty at about thirteen, but owing to hard work and the rigorous climate become prematurely old. The dress of the men consists of a long mantle of hide reaching to the ground, and an under garment round the loins, made of a poncho or piece of cloth; with buskins of the skin of horse's hock, or from the leg of the puma. The dress of the women is somewhat similar, except that the under garment, made of calico, reaches from the shoulders to the ankle. Both sexes are fond of ornaments, wearing huge square-shaped ear-rings and necklaces of silver

or blue beads; they are elaborately painted, and tattooed. The arms of the Tehuels are the gun or revolver, a sword or dagger, and long heavy lance, which they only use when dismounted, and the bola perdida or single ball, so called because, when once thrown from the sling, it is never picked up again. Their houses (called toldos) are formed of three rows of stakes driven into the ground, the middle row being higher than the others. The three rows are tied together with thongs of hide, and over this framework are thrown hides reaching to the ground on all sides, and fixed by small stakes of bone. Men and women sleep in the same apartment upon guanaco hides stretched on the ground. Both young and old bathe regularly every morning throughout the year, which not only helps to free them from the abundant vermin, but prevents disease, and enables them to withstand the severities of winter. They believe in a great and good Spirit who created them and the animals, but no traces of any periodic religious festival has been found among them. They do not worship the sun as do the Araucanians, and idols are unknown. They have a great dread of malicious demons, the chief of whom, Gualichu, they especially try to propitiate, through the mediation of the wizard, doctor, or medicine man, to whom alone he is visible. To drive away the numerous other evil spirits charms and talismans are liberally worn. It is impossible to give anything like a reliable estimate of the number of the inhabitants. Captain Musters sets it down at 3000, but other authorities state it as high as 150,000. The population is rapidly decreasing, partly owing to disease, and partly to bad liquor supplied by the traders at the stations. The most important of these stations is Patagones, on the Rio Negro, with a pop. of 2000, composed of Spaniards, negroes, and convicts from Buenos Ayres. There is also a not very flourishing Welsh settlement at the mouth of the Chupat, and a small station at the mouth of the Santa Cruz. See At Home with the Patagonians, by G. C. Musters (London, 1871).

PATCHOULI, a perfume obtained from the dried leaves and branches of the *Pogostemon patchouli*, a native of India and China, where it is cultivated on a large scale; the plant has been recently acclimatized in France. The branches and young leaves are highly odoriferous, like sandal-wood, but the perfume is much more intense. The essence obtained from them by distillation is a kind of heavy dark-brown oil, which nullifies the effect of an equal weight of any other vegetable perfume which may be mixed with it. It is used in India to scent the costly Cashmere shawls, with the view of keeping out moths; hence real Cashmere shawls were known by their scent, until the French, who had succeeded in imitating the fabric, found out this secret also, and imported the plant for a like use. In Asia it is also used for scenting tobacco and hair-oil, and is everywhere valued as a preservative of woollens and linens from insects. The pure essence, having a disagreeably powerful odour, requires to be greatly diluted for the purposes of the perfumer.

PATELLA, the name applied in anatomy to the 'knee-cap' or 'knee-pan,' the sesamoid bone of the knee, or that developed within the tendons of the extensor muscles of the thigh. (See KNEE.) The name is also applied to denote the Limpet *genus* of Gasteropodous molluscs (see LIMPET and MOLLUSCA), of which genus the Common Limpet (*Patella vulgata*) is a familiar species.

PATEN (Latin, *patina*, a small dish), in ecclesiastical usage, the small circular plate or salver on which is placed the elements of bread in the eucharistic service. In ancient times it was of considerable size, and was often made of wood or glass; but as the church became more wealthy they were made of gold, silver, or latten. Some which have been preserved are richly ornamented with gems, enamels, and engraved work, and are exquisite specimens of mediæval art.

PATENT, in law, a privilege granted from the crown by letters patent (whence the name), conveying to the individual or individuals therein mentioned the sole right to make, use, or dispose of some invention of new and useful machinery and processes in the arts for a specified period of time. The laws under which patents are granted vary in their form in the several European and American states, and are all, in some degree, imperfect and ineffective of their proper object. In the United Kingdom the law of patents rests upon the statute 21 Jac. i. 3, which, after declaring void all monopolies, grants, letters-patent and licenses, for the sole buying, selling, and making of goods and manufactures, except in some particular cases, enacts, That any declaration before mentioned shall not extend to any letters patent and grants of privilege for the term of fourteen years or under, thereafter to be made, of the sole making or working of any manner of new manufactures within this realm, to the true and first inventor and inventors of such manufactures, which others at the time of making such letters patent and grants shall not use, so as also they be not contrary to the law, nor mischievous to the state, &c. The law was amended during the reigns of Queen Anne, William IV., and by 1 Vict. cap. lxxiii., and 2 Vict. cap. lxvii., and 15 and 16 Vict. cap. lxxxiii. As the law now stands the manufacture that is the subject of a patent right must be new within this realm, and must be such as other persons at the time of granting such letters patent do not use. The person applying for the patent must be the true inventor, yet if the secret is acquired abroad by one who introduces it into the kingdom he can legally claim the right of patent. If two or three persons jointly take out letters patent, each must have taken some part in the invention, otherwise the patent will be void. Every manufacture must be new, not used before by the inventor or any other person, and must be vendible and useful. The act of 1852 constitutes the lord-chancellor, the master of the rolls, the attorney-general, the solicitor-general, the lord-advocate and solicitor-general for Scotland, the attorney-general and solicitor-general for Ireland, with such persons as her majesty may appoint from time to time, commissioners of patents for inventions, and empowers them to lay down rules from time to time for the minor details of proceeding; but the act itself defines the question of fees, and the general character of the forms and documents.

The process of applying for a patent is as follows:—The applicant presents a petition to the commissioners, accompanied by a declaration of the grounds of his request, and a specification, either provisional or complete, signed by or on behalf of the applicant, describing the nature of the invention, and, where necessary, accompanied with a drawing of the invention. The difference between a provisional and complete specification, is that in the former kind of document the details are reserved, in the latter they are expressed. The applicant is then referred to one of the law officers of the crown, who may call in the aid of practical persons as he may see fit, the services of such persons to be paid by the applicant. The law-officer may, if satisfied, give a certificate of allowance, and thereupon provisional protection is extended to the invention for six months. The applicant next gives notice to the commissioners of his intention to proceed with his application, which is advertised, and any person interested in opposing letters-patent within a certain period may lodge par-

ticulars in writing of his objections. The period having expired, the specification and the objections (if any) are referred to the law-officer, who, after such hearing as he thinks necessary, may cause a warrant to be made for the sealing of the letters patent; which, having been sealed by the commissioners, the lord-chancellor may cause letters patent to be sealed with the great seal, granting the exclusive right to the invention within the United Kingdom, the Channel Islands, and the Isle of Man for fourteen years. The provisional protection of the patent is secured for six months by the payment of £5 in fees; the sole use for three years by that of £25; for seven years by that of £75; and for fourteen years by that of £175; the liberty being accorded to the inventor at each stage of deciding whether or not he will advance to the next. If at the end of fourteen years his profits have been inadequate, he may petition the crown for an extension of the term of his patent; but it is not often that such extension is granted, and then only on the ground that, while hitherto almost unprofitable to the inventor, the invention is one of great public utility.

The object of the specification is to put the public in full possession of the inventor's secret, so that any person may be in a position to avail himself of it when the term of the patent has expired. It should be such a description as to enable persons of ordinary skill to make the patent article by simply following the directions given, without resorting to contrivances of their own. The specification is bad, and will render the patent void, when its terms are ambiguous; when necessary descriptions are omitted; when parts are claimed which are not original; when things are inserted to mislead; when the drawings are incorrect; when one of different ways, or of different ingredients fails; when one of several specified effects is not produced; when the things described are not the best known to the patentee. Where it is discovered that an invention, for which a patent has been granted, is not new, although not generally known to the public, the patentee may obtain from the crown a confirmation of the original grant. The patent may be assigned in whole or in part by the patentee to any number of persons; it may also be mortgaged, and licenses may be granted for the use of the patent in a variety of modes. But all assignments and licenses must be registered at the Great Seal Patent Office, in order to give a title to the parties interested. The property in a patent can be defended from infringement by an action at law. By 22 Vict. cap. xiii. the secretary for war is enabled to avail himself of, and keep secret, any invention for improvements in instruments and munitions of war.

Opinion is largely divided as to the efficiency of the patent system in promoting the mutual interests of the inventor and the public. Many practical men have advocated the abolition of the system altogether, on the ground that the good results, whatever they may be, are overbalanced by the bad. It is the opinion of the great majority of manufacturers, however, that further reform is preferable to abolition. We may briefly illustrate the actual working of the system. In 1864 the superintendent of specifications, Mr. Bennett Woodcroft, examined 100 patents out of those applied for in 1855. Out of that number he found ninety-six of little or no value as to the merit of the inventions, and four of moderate value; there being thus none of great promise. Out of the 100 applications seventy patents were granted, of which one became void at the end of six months, fifty-one at the end of three years, and fifteen at the end of seven years, the parties declining to pay the accumulating fees. He finds that about the same ratio is exhibited in the whole of the 3000 or so applied for annually. In 1862 he found 98 per cent. of little or no value, 1 of some, and 1 of considerable importance.

The expenses and regulations under which foreign patents are granted vary considerably. In the United States patents are granted only to the absolute inventor, always for seventeen years, without the privilege of renewal, and may be granted or withheld at the option of the government commissioners of patents. A fee of $15 (£3) is required on filing the application, and $20 (£4) when the patent issues; these charges by a recent law being the same whether the applicant is a citizen of the United States or a foreigner. If the application be rejected two-thirds of the fees paid are returnable. In France patents are granted alike to natives and foreigners, and the duration of the privilege may be fixed by the patentee at five, ten, or fifteen years, the amount of tax being proportional to the term; 500 francs for five years, 1000 for ten years, and 1500 for fifteen years. In Belgium patents are granted for five or ten years; imported inventions are patentable, and the government tax, which is not heavy, is paid annually in small instalments, increasing by 10 francs each year. In Holland patents are granted for five, ten, or fifteen years, and may be had for foreign as well as native inventions. The fees for a patent for five years are about £12, 10*s*., and for the longer terms they vary from £25 to £62, 10*s*. In Austria patents are granted for terms from five to fifteen years; the taxes must be paid on application, and the invention put in practice within one year from date of the grant. In Germany, Russia, and Italy the governments exercise a discretionary power in granting patents, and the laws are of a stringent and arbitrary character. The Swiss governments grant no patents.

PATENT OFFICE, LIBRARY, AND MUSEUM, establishments brought into existence by the Patent Law Amendment Act, 15 and 16 Vict. cap. lxxxiii. (1852), which provides that the commissioners are to cause indexes to be made of specifications, disclaimers, and memoranda of alterations heretofore, or to be hereafter, filed, which may be printed and published; and that a register of patents, and also a register of proprietors are to be kept, to be open at convenient times to the public. Rooms were rented in Southampton Buildings, London, a superintendent of specifications was appointed in the person of Mr. Bennet Woodcroft, himself, in past years, an inventor and patentee in certain departments of mechanical art. The commissioners undertook to print, on their own resources, the specifications of all the patents ever granted in this country. These patents, from 1711 to 1852 (before the passing of the new act), amount to 12,977, and it has been the work of several years to print them all. There were a few patents of earlier date, between 1617 and 1711, but none before the last-mentioned year were in so complete a form as to render the printing of the specifications worth while. The expense of this large undertaking was £92,000 for paper, printing, and lithography. The total number of specifications, from 1617 to December 31, 1870, is 72,586. The price of a set (and they are sold at about cost price) would be £2448. The number of specifications added to the list every year is about 2000. Of these not more than 500 to 600 overlive the third year, the patentees being unwilling to pay the £50 of duty which then becomes payable, and only about 100 are willing to pay the £100 due at the end of the seventh year. The specifications are printed in small quarto, each complete in itself, with lithographed copies of any drawings or diagrams necessary for illustrating the invention, and sold separately, at prices ranging from 1½*d*. to 3*s*. or 4*s*.

each, the average being about 8*d*. The printing and publication are completed within three weeks of the time when each final specification reaches the hands of the superintendent. Any one of these printed copies, with the accompanying drawings, may, if stamped and certified, be received in any law or equity court in the kingdom, in evidence of the patent to which it relates, the production of the original documents being unnecessary. The formidable work of indexing all these patents has been admirably done by Mr. Woodcroft, who has prepared chronological, alphabetical, subject-matter, and other indexes, extending to more than sixty volumes. By means of these the searcher may discover any patent he may wish to see, if he knows the date when it was taken out, the patentee's name, or its subject. In 1871 the commissioners commenced the weekly publication of a chronological and descriptive index, in which are printed abridgments of specifications as fast as the term of secrecy expires, together with continuous indexes of persons and subjects. In addition abridgments have been drawn up of most of the earlier specifications, and in course of time will be of all. The commissioners send copies of the printed specifications, old and new, and of nearly all their other printed works, to the British Museum, the Society of Arts, four universities or colleges, twenty government offices, the public libraries of every important manufacturing town in the kingdom, foreign governments, and partial sets have been sent to about 300 mechanics' institutes throughout the kingdom. The Commissioners of Patents' Journal is published bi-weekly, and contains notices of application for letters patent, and of the stages through which the patent has to pass. A complete set of the specifications, comprising nearly 3000 volumes, lies in the reading-room of the head office in Southampton Buildings, which is open to the public. Besides this the library and reading-room have been furnished with a large and valuable collection of scientific and technical works and periodicals, home and foreign, to which large additions are made annually. The commissioners having come into possession, by gift and other means, of several models illustrating patented inventions, and having no place of their own wherein to deposit them for preservation and exhibition, made an arrangement with the authorities of the South Kensington Museum for the reception of these models. The Patent Museum has been greatly augmented since its opening, by specimens, diagrams, drawings, and portraits, occupying a building adjacent to the South Kensington Museum.

PATERA, a small dish or vase, usually made of gold, silver, bronze, or marble, in which the Greeks and Romans offered libations of wine to the gods at festivals and sacrifices, and in which they received the blood of offered victims.—In architecture, the representation of a cup, usually in bass-relief, and employed to decorate friezes, imposts, &c.

PATERCULUS, Caius Velleius, an ancient Roman historian, was born about 19 B.C. of a family in Campania, which had borne various important offices in the state. He served under Julius Cæsar in his expedition to the East, and under Tiberius in Germany as commander of the cavalry, and in the first year of that emperor's reign was nominated prætor. Nothing further is known of him; but the praises he bestowed upon Sejanus have led to a supposition that he was a partisan of that minister, and involved in his ruin. His death is supposed to have taken place in 31 A.D. Paterculus composed an abridgment of Roman history in two books, of which the beginning and a portion following the eighth chapter of the first book is wanting; unfortunately what remains is incurably corrupted, only one manuscript having been discovered. His history commenced apparently with the siege of Troy, and ended with the year 30 A.D., and is rather a narrative of a few of the more prominent events than a consecutive history. His style is pure and elegant, evidently founded upon that of Sallust, and he excelled in a brief and forcible manner of drawing characters; but his connections with Tiberius and Sejanus rendered him an adulator of those personages, and warped his representations of the actions and characters of the republican party. The most esteemed editions of this classic are those of Burmann (Leyden, 1719), of Ruhnken (Leyden, 1779), and of Orelli (Leipzig, 1835).

PATERNO (ancient *Hybla Major*), an ancient town, Sicily, 10 miles north-west of Catania, containing, among other antiquities, the remains of baths, of an aqueduct, and of a large bridge over the Simeto. In the vicinity are mineral springs and a salt-mine. Important markets are held in the town, and in the surrounding districts hemp, flax, the vine, and the olive are cultivated. Pop. 15,178.

PATERNOSTER (Latin, Our Father), the opening words of the Latin version of the Lord's prayer, hence employed to designate the prayer itself. This divine formula was given on two different occasions: first, when Christ, at the beginning of his ministry, in the sermon on the mount, addressing the large multitude assembled, warned them against the vain ostentations and repetitions of the hypocrites and heathens when they pray. The prayer was introduced by the injunction, 'After this manner, therefore, pray ye' (Matt. vi. 5–9). On the second occasion it was repeated to a small circle of his disciples, when it was introduced by the words, 'When ye pray, say, Our Father' (Luke xi. 2–4). On the first of these occasions the prayer seems to have been given as a typical example of the form in which prayer ought to be offered up; on the second this example seems to have been enforced as an absolute form. Grotius, Lightfoot, and several German critics of a later date, have attempted to prove that the Lord's prayer was founded on prayers which had been formerly in use among the Jews, and a collection of expressions similar to those in that prayer has been culled from various portions of the Talmud and other Hebrew books. It should be borne in mind, however, that the Gospels are of more ancient date than any of the books from which this collection is drawn; and it is quite possible, Lange thinks, that the Jews may have borrowed these from the Lord's prayer. Among the earliest Christians the Paternoster was accepted from its excellence as the standard form of Christian prayer. Its use in the liturgy is frequently mentioned in the writings of the early fathers. So deep was the reverence shown towards it that no unbaptized persons were allowed to use it. Among the earliest Christian writings after the apostolic age there are two special commentaries on this prayer—one by Tertullian, and the other by St. Cyprian—both written within about a century and a half after the death of St. John. The concluding clause of the prayer, known as the Doxology, 'For thine is the kingdom,' &c., is not found in St. Luke's Gospel; and even in the Gospel of St. Matthew it is only found in some of the later manuscripts, in which it is generally held to be an interpolation. The clause was, however, retained by Luther in his translation and in the English authorized version, and its use has become in consequence common among Protestants. It is not used by Roman Catholics.—*Paternoster* is also the name of the larger beads in the rosary which the Catholics use in their devotions; at this they repeat the Lord's prayer, while at the smaller ones only an Ave Maria.

PATERSON, a town of the United States, capital of Passaic county, New Jersey, on the Passaic, near its celebrated falls, communicating by two bridges with Manchester, which may be considered as its suburb, and on a branch of the Erie Railroad, 17 miles north-west from New York. Among its buildings and establishments, besides numerous churches, are a court-house and jail, a philosophical society with a valuable library, a mechanics' society with a library and philosophical apparatus, an academy, and numerous schools. The town was founded in 1791. The great command of water-power led to the selection of Paterson for the erection of numerous public works, among which are about forty cotton, silk, and woollen factories, dye and print works, iron-foundries, machine-shops, tanneries, saw, paper, and fulling mills, &c. The falls are formed by a basaltic precipice about 60 feet high, over which the river, after rushing along its rocky bed, is precipitated into a chasm, and afterwards emerges through a fissure. They have lost much of their original grandeur, especially in the dry season, from the diversion of the water by a dam to supply the numerous factories. Pop. in 1870, 33,579; in 1880, 51,031.

PATERSON, WILLIAM, first projector of the Bank of England and of the ill-starred Scottish colony of Darien, was born, it is supposed, in Skipmyre, Tinwald parish, Dumfriesshire, in the early part of 1665. He is said to have been originally destined for the Presbyterian ministry, and to have been among the Covenanters persecuted by Charles II. To avoid such persecution he went to London in the capacity of a merchant, and also visited America, where he obtained from the buccaneers much information respecting the Spanish main. It is impossible now to decide whether he was criminally connected with these marauders in their expeditions, but the probabilities are that he was not. In 1692 he was in London, where he obtained a lease authorizing him and two others to construct the Hampstead waterworks. About this time he made proposals in regard to founding a Bank of England. On the establishment of this institution he became one of the directors; but being defrauded of what he considered his just recompense by those who had adopted his scheme, he subsequently resigned. Before this time he had conceived the project of founding a free commonwealth in Darien, and attempted to obtain for it the support of England and other states. In this he failed, but in 1695 he received the sanction of a Scottish act of Parliament constituting the Darien Company. (See DARIEN SCHEME.) After the failure of the expedition he returned to England, and devised a new plan for the colony; but the death of King William, with whom he had some influence, destroyed all possibility of reviving the scheme. When the Treaty of Union between England and Scotland was passed it was recommended to indemnify him for the losses he had sustained, and reward him for other services of much benefit to his country. It was not until the reign of George I., however, and after a long struggle with government, that his claims were finally settled. His last years were spent in retirement in Westminster, where he died, January, 1719.

PATHOLOGY (from the Greek *pathos*, disease, and *logos*, doctrine or system) signifies the science or doctrine of diseases. As physiology teaches the nature of the functions of the living body in a state of health, so pathology relates to the various derangements of these functions which constitute disease. Its objects, therefore, are to ascertain the various symptoms which characterize the disorders of each organ of the body, and especially the diagnostic and pathognomic symptoms, which afford the means of discrimination between diseases that resemble each other; to determine the causes, both predisposing and exciting, by which diseases are induced; to point out the prognosis or the tendency and probable event of each disease from the changing combination of the symptoms; and lastly, to teach the indications of cure, and the nature and operation of the remedies adapted to the various circumstances and periods of diseases.

PATKUL, JOHANN REINHOLD, a Livonian patriot, was born in 1660. When Charles XI. of Sweden had encroached on the rights of the Livonian nobility Patkul took an active part in remonstrating and obtaining a redress of grievances. One of his appeals on this subject (1692) induced the government at Stockholm to summon the provincial authorities, and Patkul in particular, to the Swedish capital. Patkul received a safe-conduct, and went to Stockholm; but fearful of the intention of the court, he withdrew into Courland, and was declared infamous, and condemned to lose his right hand and his head. After spending some time in Switzerland and France, where he engaged in scientific pursuits, he was received in 1698 into the service of Augustus II., elector of Saxony and king of Poland, as privy-councillor, and used all his efforts to carry into effect the plan of a union with Russia and Denmark against Sweden. In 1702 he went to St. Petersburg, and the league with Russia was concluded. He now entered the Russian service, and after being employed in various capacities was sent as Russian ambassador to Augustus, and soon after received the command of the Russian auxiliaries, at the head of whom he captured Warsaw. Augustus had just renewed his alliance with Russia by a personal interview with the czar, when, in December, 1705, Patkul, with eighteen of his confidential friends, was arrested and thrown into prison under pretence that he had entered into treasonable negotiations with Austria and Sweden, and had endeavoured to excite dissensions between the czar and Augustus. Augustus was soon after obliged to submit to the Peace of Altranstadt (September 24, 1706), in which the surrender of Patkul to Sweden was stipulated. He was accordingly delivered up to the Swedes, although Augustus had given secret orders that he should be permitted to escape. Peter in vain demanded the release of his ambassador. The Swedish troops are said to have tied him to a cannon on their march from Saxony, and he was tried by a court-martial at the monastery of Casimir, near Posen, and condemned to death. October 10, 1707, he was broken alive on the wheel: his head was cut off, and his body was quartered.

PATMOS, or ST. GIOVANNI DI PATIMO, an island of Turkey in Asia, in the Grecian Archipelago, about 23 miles S.S.W. of Samos; lat. 37° 17′ N.; lon. 26° 35′ E.; greatest length, north to south, 12 miles; breadth, nearly 6 miles; circuit, about 28 miles. It is very bleak and mountainous, consisting of an irregular mass of rock, unwooded, bare, and barren. Where there is soil deep enough to admit of cultivation it is not unfertile, and produces some corn, wine, and vegetables, though in quantities far too limited to meet the consumption. The inhabitants have some manufactures of cotton, the material of which is chiefly grown on the island, but their chief subsistence is derived from fishing and commerce. For carrying on the latter they have the advantage of several good harbours, among others that of La Scala, which, protected by projecting capes, is one of the safest ports in the Sporades. The principal town takes the name of Patmos, and is sometimes also called St. John. It stands on the edge of a mountain, and is reached by a steep and rugged ascent. It consists of about 200 houses built of a white hewn stone, generally adorned with balconies, and present-

ing a pleasing appearance. On a height above the town stands a large convent surmounted by several irregular towers, and resembling a fortress. In a grotto belonging to the convent is the supposed abode where the apostle John, who is said to have been banished by Domitian to the island about A.D. 94, saw the visions which he has recorded in the book of Revelation. Pop. of the island, about 4000.

PATNA (or more correctly PATTANA, 'the town'), a city of Hindustan, in the Presidency of Bengal, capital of one of the ten divisions of the Lower Provinces, and of a district or collectorate of its own name, on the right bank of the Ganges, on the East Indian Railway, and 397 miles by rail north-west from Calcutta. The city proper, surrounded by decayed Hindu fortifications, is little more than 1½ mile in length by about half that extent in breadth; but with its large suburbs Patna stretches 9 miles along the Ganges, and presents externally a striking appearance from the river, many large and handsome flat-roofed houses with carved balustrades being interspersed with temples, mosques, and tombs (including the tomb of Shah Arzani), Saracenic gateways of red stone, large granaries, wide ghauts or stairs from the water, and bastions projecting into the stream—the whole backed by a height on the land side. On its east side is a large suburb in which are many large storehouses, and the palace and extensive gardens of Jaffir-khan; on the west is the suburb Bankipur, where are government offices and most of the residences of the European inhabitants. Internally the city has but one broad street; the other thoroughfares are narrow, crooked, and irregular; extremely dusty in dry, and muddy in wet weather. The dwellings of the middle classes have much of a Chinese character, each stage being surrounded by a verandah. The adjacent cantonments at Dinapur are handsome and well laid out; in addition to a native force, a royal regiment is stationed there. Patna is a stronghold of Mohammedanism, and the chief seat of the opium trade. A large trade is carried on in oil-seeds, rice, saltpetre, wheat, indigo, sugar, and provisions; amongst the manufactures are table-linens, wax-candles, lacquered wares, and bird-cages. At Hajípur, on the opposite side of the Ganges, a large fair is annually held, to which shawls, pearls, gems, gold ornaments, and all other kinds of Indian produce are brought, and where visitors from the city and elsewhere live in camps, luxuriously fitted up during its continuance. Under the ancient name of Padmavati, Patna is supposed to have been an important place, and the capital of Behar as far back as B.C. 419. The English, French, and Danes had formerly factories here, but eventually the British traders drove out their rivals. In 1793 disputes about transit duties arose between the East India Company's servants and the native government. The result of the war which followed was the expulsion of the native forces, and the district coming into possession of the British. Patna was the head-quarters of the Wahabee or Mussulman conspiracy of 1864. Pop. (1881), 170,674.

PATRAS, or BALIABARDA (anciently *Aroé* and *Patræ*), a fortified seaport and the most important trading town of Greece, in the Morea, on the east side of the gulf of same name, 10 miles S.S.W. of Lepanto, in the government (nomarchy) of Achaia and Elis. It consists of several wide and regular streets intersecting each other at right angles, several of them lined with arcades. Many of the houses are large, but the majority are only of one story, being built thus low as the best precaution against earthquakes, which are here very frequent. The public buildings include several churches, two hospitals, and a celebrated castle of great strength, which the Turks, after they had lost the rest of the country, continued to hold during the greater part of the war of Independence. The manufactures consist chiefly of capotes, made of a mixture of goats' hair and wool, and famous throughout Greece both for their quality and cheapness; and the trade is chiefly in corn, wine, oil, fruit (particularly raisins), silk, cotton, wool, and hides. Population in 1879, 25,494. The Gulf of Patras lies between the north-west part of the Morea and Livadia or Northern Greece, formed on the west by the Capes of Scropha and Papas, and communicating on the east with the gulf by the Strait of Lepanto; greatest length, east to west, about 30 miles; greatest breadth, 14 miles. It is exposed to heavy swells, and is in consequence dangerous to navigate, especially during winter.

PATRIARCHS (from the Greek *patria*, tribe; *archein*, to rule) are the antediluvian heads of families, and the three fathers of the Hebrew race, Abraham, Isaac, and Jacob. The epithet *patriarchal* is hence used to denote the innocence and simplicity of the early ages, and the venerable dignity of age. The patriarchal government is that which prevails in a state of society in which the people are not yet organized into a nation, but form independent tribes, clans, or families, under the government of their common ancestor, or his representative, the existing head of the family. The term *patriarch*, at a later period, became the title of the presidents of the sanhedrim, which exercised a general authority over the Jews of Syria and Persia after the destruction of Jerusalem. The patriarchate of Tiberias for the Western Jews subsisted till 415, that of Babylon for the Eastern Jews till 1038. From them the title was adopted by the Christians, who applied it, from the beginning of the fifth century, to the bishops of Rome, Constantinople, Alexandria, Antioch, and Jerusalem. These patriarchs exercised the power of consecration, and of supervision over the archbishops and bishops within their jurisdictions. While the Patriarch of Rome became the supreme pontiff of the West (see POPES), the four heads of the Eastern church preserved the title of patriarch, but were nearly stripped of their authority by the conquests of the Saracens. The Armenian, Abyssinian, Jacobite, and Maronite churches have their own patriarchs. The Patriarch of Constantinople is the primate of the Greek Church in the Ottoman Empire, and bears the title of *œcumenical*. He is invested with his dignity by the sultan. (See GREEK CHURCH.) The Patriarch of Moscow, whose authority extended over the Russian Church, was superseded, during the reign of Peter the Great, by the holy synod. In the Catholic Church the Archbishops of Lisbon and Venice have the title of patriarch. The latter has no superiority over other archbishops; the former is primate of Portugal. The patriarchate of Aquileia was divided in 1751 into the archbishoprics of Udine and Görz (since of Laibach).

PATRICIANS (Latin, *patricius*, from *pater*, father), the name given by the Romans to the members and descendants by blood or adoption of the original *gentes* of which the populus Romanus was wholly composed, until the plebeians became a distinct class of citizens. The other parts of the Roman population, the clients and slaves, did not belong to the populus Romanus. Originally the two tribes of Ramnenses and Titienses enjoyed exclusive political privileges, but the Etruscan tribe of Lucerenses was admitted to the same rights by Tarquinius Priscus (himself an Etruscan). Notwithstanding this equalization the two older tribes were known as the *patres majorum gentium*, and the new tribe as the *patres minorum gentium*. Each tribe consisted of ten *curiæ*, and each *curia* of ten *gentes* and of the same number

of *decuriæ*, which were established for representative and military purposes. The gens, all the members of which bore the same gentile name, sent its leader to the senate, so that the number of senators for the three tribes amounted to 300. During the time of the republic distinguished foreigners and wealthy plebeians were occasionally made patricians. When the plebeians became a distinct order the patricians became a real aristocracy of birth, and occupied all the civil and religious offices. No matter how poor he was there was no power could make a patrician a plebeian, unless he, of his own accord, left his gens and curia, and gave up its obligations and privileges. On the other hand, no plebeian, however wealthy, could become a patrician, except in accordance with a *lex curiata*, or law of the curiæ, and this was seldom passed. About the close of the republic the number of patrician families had diminished to fifty. Julius Cæsar, Augustus, and succeeding emperors found it necessary to raise plebeian families to the patrician rank. During the first centuries of the republic there was an almost uninterrupted struggle between the patricians and plebeians, in which the former fought hard to retain their exclusive rights, but which ended in the establishment of the political equality of the two orders; only a few insignificant offices remained the exclusive privilege of the patricians. The formation of a new aristocracy, founded on wealth and on the holding of the offices of consul, prætor, and curule ædile, made the patricians of still less account. During the empire the Roman citizens were divided into the two classes of populus and patricii. The conquest of Rome by the Goths, which deprived many of the patricians of their liberty or their lives, or compelled them to flee to Constantinople, led to the abolition of all distinction between patricians and plebeians. When the seat of government was removed to Constantinople, Constantine the Great, desirous of restoring the ancient Roman ranks, instituted a new patrician dignity, which was a mere personal title, and which could be acquired only by high birth and distinguished merits. Under the Carlovingians and the succeeding emperors the title of patrician denoted an exalted rank, and was connected also with the government of Rome and its provinces, and the support of the Papal see. Charlemagne assumed the title of a Roman patrician before he was declared emperor, and Henry IV., as such, deposed Pope Gregory VII. In modern times a few noble families in the imperial cities were called patricians, because they were especially entitled to certain high offices. In some Italian cities the title of patrician is still used to denote a member of the nobility.

PATRICK (PATRICIUS), ST., the apostle of Ireland, was born, according to some authorities, in 372, and to others 377 or 387. His birth-place is equally a matter of uncertainty. From his Confessions we learn that his father, Calpurnius, descended from a Breton family, had served as a decurion in the Roman army, and possessed a farm near Bonavem Taberniæ, which is supposed by some to be near the site of Boulogne-sur-Mer, and by others at the place called after him, Kilpatrick, in Dumbartonshire. His mother, according to some ancient biographers, was called Conches or Conchessa, and is said to have been a sister of the Bishop of Tours. At the age of sixteen Patrick (or rather Succath, for such was his name previous to his setting out on his great mission) was carried off from his father's farm by a band of pirates, who sold him to an Ulster chief named Milhu, whose flocks he tended for six years. At the end of that period he made his escape, and went to France, where he became a monk, residing for some time at Tours, and afterwards in the famous monastery of Lerins. Here he did not remain long, for, as he tells us in the work already alluded to, he was moved by visions to undertake the conversion of the Irish to Christianity. Having been ordained a bishop and received the Papal benediction from Celestine I., he went over to his chosen field of labour about the year 432. Here he is said to have founded over 360 churches, baptized with his own hand more than 12,000 persons, and ordained a great number of priests. He fixed his see at Armagh about the year 454. Many miracles are ascribed to him, particularly the extirpation of all venomous creatures in the island. The date of his death is variously set down at 460 and 493; it took place at a place called Saul, near Downpatrick, and his relics were preserved at Downpatrick till the time of the Reformation; the place is still venerated by the Irish. His authentic literary remains consist of his Confessions and a letter addressed to a Welsh chief named Corotic, both written in barbarous Latin, but of considerable historical value. These, with several other productions ascribed to him, were published in Wilkins's Concilia, and separately by Ware in 1656. A biography of the saint was published by Dr. Todd (one vol. 8vo, Dublin, 1863).

PATRICK, ST., ORDER OF, an Irish order of knighthood, instituted in 1783 by George III., originally consisting of the sovereign, the lord-lieutenant of Ireland for the time being (who is the grandmaster of the order), and fifteen knights; but by a statute in 1833 the order was enlarged and the number of knights raised to twenty-two. The insignia of the order are a gold collar, composed of red and white enamelled roses alternating with harps bound together with knots of gold; in the centre is an imperial crown, surmounting a gold harp, from which is suspended the badge, which is also of gold and oval in shape; in the centre of the badge is the cross of St. Patrick, surmounted by a shamrock, the leaves of which bear an imperial crown; round this is a blue enamelled band bearing the motto 'Quis separabit.' The star differs from the badge in being circular instead of oval in shape. The mantle and hood are of sky-blue tabinet, lined with white silk.

PATRIMONIUM PETRI (Patrimony of St Peter) is the name of a former administrative division of the Papal States, consisting chiefly of the territory given to the pope by Matilda, countess of Tuscany, in the twelfth century. It corresponds to what was the modern delegation of Civita Vecchia, and the north-west part of the comarca di Roma.

PATRISTIC THEOLOGY (*Theologica Patristica*), that branch of historical theology which is particularly devoted to the lives and doctrines of the fathers of the church. In the beginning of the present century the German Protestants paid particular attention to it, as affording a satisfactory, though laborious way of arriving at the history of the Christian doctrine and constitution in the first six centuries. See Engelhardt, Leitfaden zu patristischen Vorlesungen (Erlangen, 1822); Möhler, Patrologie, edited by Reithmayr (vol. i. parts 1 and 2, Ratisbon, 1839–40).

PATROCLUS, the friend of Achilles, was the son of Menœtius, one of the Argonauts, and of Sthenele or Polymela. He accidentally killed Clysonymus, the son of Amphidamus, in a game of dice at Opus. His father saved him by flight, and carried him to Peleus, by whom he was kindly received and educated as the companion of his son. He accompanied Achilles to Troy, and remained, like him, inactive, when the anger of Achilles prevented him from taking a part in the war. At length the necessity of action seemed so urgent that Achilles permitted Patroclus to go to the war, arrayed in his own armour. His success was at first brilliant; but, Apollo having stunned him and rendered him defenceless, he was slain by Euphorbus and Hector. The Greeks re-

Aberdeen's Act), was law up till 1874. The first step in the settlement of a parish minister was the presentation by the patron; but the presentee, before he had a right to the emoluments of the benefice, had to be admitted to it by the presbytery. He was first appointed to preach certain trial sermons. By Lord Aberdeen's act it was provided that after the trial sermons the presbytery should give to the members of the congregation opportunity to state any important objections to the presentee. The presbytery were to dispose of these objections or refer them to a superior church court; and if the objections were considered well founded the presentee could be rejected by the presbytery. By the Patronage Act of 1874, 37 and 38 Vict. cap. lxxxii. patronage was again abolished, and the right of choosing their own minister devolved upon the congregation, the former patron to receive as compensation a sum equal to one year's stipend, or a proportion thereof if he is a joint patron. In the Protestant churches of Denmark, Germany, and Sweden patronage exists to some extent, subject to more or less restriction in different localities. In the Greek Church it is in the hands of the bishops, except in Russia, where lay patronage is exercised to a certain extent.

PATRONYMIC (Greek, *pater*, father, and *onoma*, name), a name which designates a person in reference to some of his ancestors, either immediate or remote. In Sanskrit, Greek, and Latin patronymics are very common. In Sanskrit they have thirteen recognized terminations. In Greek the suffixes were *idēs, iōn, iadēs, eides*, &c. for the masculine, and *ias, is, as*, &c. for the feminine. Achilles is called by Homer both Pelides and Æacides, Peleus being his father's name and Æacus that of his grandfather. The Latins borrowed their patronymic terminations *ides* and *is* from the Greek. Among modern languages the Russian, Danish, German, and English have adopted patronymic terminations, the suffixes being respectively *vitch, sen, sohn* or *son*, and *son*. The Norman *Fitz*, the Welsh *Ap*, the Irish *O*, and the Highland *Mac* are prefixed to the paternal name, which thus becomes a patronymic. See NAMES (PERSONAL).

PAU, a town of France, capital of the department of Basses-Pyrénées, on a lofty ridge on the right bank of the Gave-de-Pau, here crossed by a fine bridge, 58 miles E.S.E. of Bayonne, and commanding a magnificent view of the Western Pyrenees. It has several squares, of which the Place Royale, with a finely planted promenade, and a marble statue of Henry IV., and the Place-de-la-Comédie, communicating with a suburb by a bridge which spans a deep ravine, are the most deserving of notice. The most conspicuous and interesting edifice is the castle in which Henry IV. was born, crowning a lofty peak at the western extremity of the town, and overhanging the Gave. It is a huge, angular, and irregular structure, flanked with towers, of which five still remain, the highest (the Tour de Gaston-Phœbus) or donjon having a height of 100 feet, and another, called the Tour de la Monnaie, being the traditional asylum which Margaret of Valois gave to Calvin and other persecuted reformers. Great part of the castle was restored in good taste, and provided with antique furniture acquired at great expense by Louis-Philippe. Pau has a court of appeal for the departments of Basses-Pyrénées, Hautes-Pyrénées, and Landes; courts of first resort and commerce; an academy, college, museum, library, agricultural society, and society of science, literature, and art. The manufactures consist of napkins, excellent table linen, rugs, carpets, paper, and leather. The trade is in wine, Bayonne hams, salt provisions, excellent chestnuts, printed cottons, iron, &c. Pau has given birth to two sovereigns, Henry IV. and Bernadotte (Charles XIV. of Sweden). It is a favourite resort of the English in winter, having a mild, dry climate, with no sudden variations of temperature; it is a convenient starting-place for travellers desirous of exploring the Pyrenees. Pop. (1881), 29,971.

PAUL, the apostle of the Gentiles, was born of Jewish parents, at Tarsus, in Cilicia, and inherited the rights of a Roman citizen. His original name was Saul. He received a learned education, and early went to Jerusalem to study under Gamaliel, one of the most celebrated Jewish rabbins in the time of our Saviour, who instructed him in the Jewish laws and traditions. He was also acquainted with the Greek poets and philosophers, as his epistles show, and learned a trade (that of a maker of tents), according to the custom of the Jewish teachers, by which he afterwards supported himself in his travels. Thus prepared for the office of teacher, he joined, a few years after the death of Jesus, the sect of the Pharisees, and became a persecutor of the Christians, to crush whom the Sanhedrim employed him both in and out of Jerusalem. The Acts of the Apostles contains several instances of the heat of his zeal in this cruel work, upon which he entered from his attachment to the law of his fathers. He was present at and encouraged the stoning of Stephen to death. He was even on his way to Damascus, with full power from the chief priests to arrest the Christians, when he was led by a miracle (Acts ix. and xxii.) to view Christianity in a different light, and to seek a personal knowledge of the excellence of the religion from the instructions of Christian teachers. The disciples had at first strong suspicions against their late persecutor, but they were allayed by Barnabas. His former coreligionists on various occasions tried to compass his death. His sudden conversion, effected by the divine interposition, was indicated by the change of his name from *Saul* to *Paul*, and he engaged in the work of an apostle with an ardour that overcame every difficulty. Arabia, Syria, Asia Minor, Greece, and the islands of the Mediterranean were the scenes of his unwearied activity in promulgating the doctrines of Christianity. In all his journeys he laboured to establish new churches and to confirm the faith of those already existing. He made himself useful to the churches of Antioch (where he first preached the gospel to the Gentiles), Ephesus, and Jerusalem by instructing them, by arranging their ceremonies, and collecting alms for the poorer members. The churches of Philippi in Macedonia, of Corinth, Galatia, and Thessalonica honoured him as their founder; and the Epistles in the New Testament, which he wrote to these churches, and to the churches in the chief cities of Greece and Asia Minor, and to Rome, show the paternal relation in which he stood to them and the paternal care which he exercised over them. By admitting the Gentiles to a participation in the blessings of Christianity, without requiring them to submit to the Jewish rites, he promoted the progress of Christianity far more than he could have done had he baptized none but his own countrymen. But this conduct exposed him to the hatred of the Jews, who persecuted him as an apostate; and everything at Jerusalem was prepared for his destruction. In the sixtieth year of the Christian era, after labouring with unwearied zeal for more than twenty years to spread the doctrines of Jesus, he boldly went to Jerusalem with the money which he had collected for the support of the oppressed Christians in Palestine. He was there arrested and brought to Cæsarea, where he was kept a prisoner for two years by the Roman governors Festus and Felix. The fearless spirit with which he explained his whole conduct excited the same admiration which had been produced in the Areopagus and among the

wise men of Athens (where Dionysius the Areopagite became one of his adherents) by his enthusiastic eloquence. Having been illegally imprisoned he appealed, as a Roman citizen, to the emperor, and was sent to Rome. He was shipwrecked at Melita (Malta), and in the spring of the year 62 arrived at the capital of the world. He was treated with respect, but as a prisoner of state, and gained over many distinguished Romans to the Christian faith. It is certain that he was set free in the year 64; but the account of his farther travels in Spain, Britain, Macedonia, Greece, and the borders of Asia is founded solely on conjecture. In the year 66 Paul returned to Rome, was again arrested, and, according to the early church historians, died the death of a martyr. The history of no apostle is so rich in remarkable events, hardships, and sufferings as that of this great man. Even the enemies of the religion for which he lived and died could not deny the gifts of his mind, his deep and extensive knowledge, profound understanding of the nature of religion, richness and acuteness of thought, and high talent for teaching.

PAUL, the name of five popes.—PAUL I., pope from 757–767, brother of Stephen II., stood on good terms with Pepin and Charlemagne. A council held under him at Gentilly maintained the procession of the Holy Spirit from the Son, in opposition to the Greek Church. Letters written by him are still extant, and he has found a place in the calendar.—PAUL II., pope from 1464–71, a native of Venice, originally called Pietro Barbo, archdeacon of Bologna and bishop of Cervia, then apostolical protonotary and cardinal, a nephew of the notorious Eugenius IV., was ostentatious and dissipated in his habits. Shortly after the commencement of his pontificate he annulled the electoral law, which not long before had been arranged with the emperor. He excommunicated George Podiebrad, caused a crusade to be preached against him, and was continually engaged in dealings with King Ferdinand of Naples. In France, owing to the firmness of the parliament, he could not succeed in obtaining a formal repeal of the pragmatic sanction.—PAUL III., pope from 1534–49, formerly Alessandro Farnese, a Roman by birth, bishop of Ostia and dean of the college of cardinals, established the order of Jesuits, opened the Council of Trent, defended himself by his legates in the conferences between Catholics and Protestants at the Diets of Worms and Ratisbon; established, on the suggestion of Cardinal Caraffa, a general inquisition for the suppression of Protestantism, and thereupon began a reckless crusade against the Reformation.—PAUL IV., pope from 1555–59, formerly John Peter Caraffa, a Neapolitan, bishop of Chieti, protested, along with Cajetan, founder of the order of Theatines, against the religious Peace of Augsburg, and the conferring of the imperial crown on Ferdinand I. He energetically directed the power of the Inquisition against everything tending to favour Protestantism, established an Index Librorum Prohibitorum, caused a vigilant search to be made after heretical books for the purpose of burning them, and, not satisfied with combating the advancing opinions of the age, sought to re-establish the ancient supremacy of the Papal see. His violent proceedings were so detested by the people and a great part of the nobility of Rome, that a violent tumult broke out after his death, and almost every memorial of him was destroyed.—PAUL V., pope from 1605–21, formerly Camillo Borghese, a rigid canonist, in a struggle with the Venetian Republic, which held the views of Paul Sarpi, was obliged to succumb, though he was vigorously supported by the Jesuits, and especially by Bellarmin. The chief controversies of his time related to grace and the immaculate conception.

PAUL I., Emperor of Russia, son of Peter III. and Catharine II., was born in 1754. His father, on account of his dislike of Catharine, would not acknowledge his legitimacy; but on the death of Ivan in 1763 he became the sole remaining heir to the crown, and was placed under the care of Count Panin and Æpinus. His mother treated him with great rigour, and kept him constantly estranged from public affairs during her life. In 1773 he married a Princess of Hesse-Darmstadt, who died soon after, and in 1776 he married Princess Dorothea of Würtemberg, who became the mother of the Emperor Alexander I., Prince Constantine, the late Emperor Nicholas, and the Grand-prince Michael, and several daughters. In 1780 he travelled, with his wife, under the title of Count of the North, in Poland, Germany, Italy, France, and Holland, and after his return retired to his usual place of residence, the Palace of Gatschina, and was permitted to take part neither in civil nor military affairs. On the death of Catharine in 1796 the prince was finally released from his long restraint; and the first acts of his government, after performing the obsequies of his mother, and paying the last honours to his father, whose murderers he disgraced, were dictated by benevolent intentions. He put an end to the war with Persia, and liberated the Poles who were in confinement in Russia. But the severe treatment to which he had been subjected for forty years had exercised a most injurious influence upon his character, and, combined with the natural violence and impetuosity of his temper, led to those acts of despotism and folly which stain his reign. He joined the coalition of crowns against France, and sent 100,000 men, partly under Suwaroff and Korsakoff, to Italy and Switzerland, and partly to Holland. The Russian arms were at first successful; but after the defeat at Zürich his increasing distrust of the British and Austrian courts, and the artful management of General Bonaparte, who dismissed the Russian prisoners newly clothed and armed, and insinuated new suspicions into the mind of the czar, broke off his connection with the coalition. Louis XVIII., who had been received into the Russian territory with every mark of attention, and the French emigrants were ordered to quit the country. Paul had caused himself to be declared Grand-master of the Knights of Malta (1798), after the resignation of that dignity by the Baron Hompesch; but Britain, having conquered the island in 1800, refused to surrender it to the Russian emperor. Paul therefore laid an embargo on all British ships in the Russian ports, and prevailed upon the Swedish, Danish, and Prussian courts to enter into a convention for the protection of their commerce against the encroachments of the British by sea. His internal administration was characterized by similar traits of impetuosity, and in many cases of tyranny. His innovations in the army (particularly the introduction of hair-powder and queues); his prohibition against the wearing of round hats, pantaloons, &c.; his order obliging all persons who met him in the streets to leave their carriage, and prostrate themselves before him; and other acts of a similar nature, excited general discontent. Other measures of a more serious character finally produced a conspiracy among the nobles. They excited mutual suspicions between Paul and his sons, and Alexander finally consented to assume the government until the mind and health of his father were restored. The conspirators entered the antechamber of the emperor, in St. Michael's Palace, at 11 o'clock at night (March 24, 1801), by a secret passage, and the door to the emperor's chamber was opened by the guard, who was deceived by an alarm of fire. An act was then read to him, by which he was to acknowledge himself incapable of conducting the government, and

surrender it to Alexander. Paul cried out, 'I am emperor, and will remain so;' and he was then despatched by the conspirators. Some accounts say that he was strangled in his bed with his own sash. In the Russian manifesto on the subject his death was ascribed to apoplexy.

PAUL, ST. VINCENT DE, one of the most eminent of modern philanthropists, was born of poor parents, in the village of Pouay, in the diocese of Dax, in the year 1576. Some of his early years were spent on the slopes of the Pyrenees tending his father's scanty flock; but as the boy exhibited signs of remarkable promise, he was sent to be educated first at Dax, and then at Toulouse. There he completed his ecclesiastical studies, and was ordained priest in 1600. In 1605, while on a voyage from Marseille to Narbonne, he was captured by Turkish pirates, and sent to Tunis, where he was in slavery for two years under three different masters, the last of whom, a renegade from Nice, he reconverted to Christianity, and induced to escape with him to France. They reached Aigues-Mortes in a little skiff, 28th June, 1607. The next year Vincent spent in Rome, where he secured the friendship of Cardinal d'Ossat, who sent him to Paris on a secret mission to Henry IV., and who afterwards procured his nomination to the Abbey of St. Leonard de Chaume, in the diocese of Rochelle. About the same time he was appointed almoner to Queen Margaret of Valois. In 1613 Philippe Emanuel de Gondi, count de Joigny, confided to him the education of his sons, one of whom became afterwards famous as the Cardinal de Retz. In 1616 he began the course of labours as a missionary which occupied so large a portion of his life, and the next year he laid the foundation of the institution which eventually developed into the influential congregation of Priests of the Mission, an association of priests who devote themselves to the task of assisting the parish clergy, by preaching and receiving confessions periodically in those districts to which they may be invited. The associates received royal letters patent in 1627, were erected into a congregation by Pope Urban VIII. in 1632, and in the following year established themselves in the Priory of St. Lazare in Paris, whence the name of Lazarists, by which they are sometimes called. The reformation of the hospitals, the establishment of the first foundling hospital in France, the institution of the Sisterhood of Charity, the instruction of idiots at his Priory of St. Lazare, and continual labours among the convicts sent to the galleys are the next events to be recorded in his history. It is said that he wore for some weeks the chains of a convict more unfortunate than guilty, but the story has been questioned. During the famine which depopulated Lorraine (1638–39) he collected and distributed 2,000,000 livres among the sufferers. He attended Louis XIII. in his last illness, and was appointed by the queen-regent one of the four members of the Conseil de Conscience, to whom was committed the charge of distributing ecclesiastical preferments. During the wars of the Fronde the Priory of St. Lazare was sacked by the mob, Vincent being wrongfully supposed to have favoured Mazarin. Among the last acts of his life was the foundation of an asylum for aged working people of both sexes, and a hospital for all the poor of Paris, which was opened in 1657. He died in Paris, 27th September, 1660, and was canonized by Clement XII. in 1737. His preaching was more remarkable for its simple impressiveness than a show of learning. During his lifetime he published only the Regulæ seu Constitutiones communes Congregationis Missionis, and in 1826 appeared Conférences spirituelles pour l'explication des Règles des Sœurs de la Charité. He left behind him a pretty voluminous correspondence on spiritual subjects, chiefly addressed to the Priests of the Mission and other friends.

PAULA, FRANCIS DE. See FRANCIS OF PAULA.

PAULDING, JAMES KIRKE, an American author, was born in Pleasant Valley, Dutchess county, New York, 22d August, 1779. His education was acquired partly at a village school, and partly by a course of self-instruction. About the beginning of the present century he removed to New York, where he became intimately acquainted with Washington Irving, and published in connection with him a series of humorous and satirical essays, entitled Salmagundi. Gratified with the success of this work Paulding determined to devote himself to literature, and during the war between the United States and Britain in 1812 he published an allegorical satire, called The Diverting History of John Bull and Brother Jonathan. In 1813 appeared his Lay of the Scottish Fiddle, a burlesque of Scott's Lay of the Last Minstrel. It was followed by a pamphlet on the United States and England, defending American institutions from the attacks of the Quarterly Review. This brought him under the notice of President Madison, who appointed him secretary to the Board of Naval Commissioners. A visit to Virginia gave him the materials for his next work, Letters from the South by a Northern Man (1817); and the following year he published his longest and best poem, The Backwoodsman. His succeeding works of importance are a second series of Salmagundi, entirely his own composition (1819); A Sketch of Old England by a New England Man (1822); John Bull in America, or The New Munchausen (1824); his first novel, Koningsmarke (1823); Merry Tales of the Wise Men of Gotham (1826); The Travellers' Guide (1828), called in subsequent editions The New Pilgrim's Progress, owing to the curious mistake of its having been considered a *bona fide* guide book; The Dutchman's Fireside (1831), a story of the old French war, the finest of his novels; Westward Ho! (1832), another successful novel; A Life of Washington (1835); Slavery in the United States (1836), in which he defends the planters' view of that institution. Having held for some years the lucrative post of navy agent for the port of New York, he was appointed in 1837 by President Van Buren secretary of the navy. In 1841 he retired to his country seat at Hyde Park, where he spent the remainder of his life. Here he produced two novels, The Old Continental (1846), and The Puritan and his Daughter (1849); together with a collection of stories, entitled A Gift from Fairyland, and in connection with his son, William Irving Paulding, a volume of American Comedies (1847). His death took place 6th April, 1860.

PAULICIANS. In the chains of the Caucasus and Taurus, which unite in Armenia, a few of the ancient Manichæans and Gnostics were remaining in the eighth century, who assumed the name of *Paulicians*, from Paul their leader, to save themselves from the persecutions to which the Manichæans were always exposed. As iconoclasts they were favoured or persecuted by the Greek emperors according as the latter were favourable or otherwise to the worship of images, which the Manichæans totally rejected. When their Manichæism was discovered in the ninth century they were subjected to violent persecution. Many of them were put to death; others fled to Mohammedan countries, and assisted them in their wars against the Greeks. In the tenth century the attempts at the conversion of some Paulicians who returned, and were fixed in Thrace by John Zimisces, the Greek emperor, were as unsuccessful as the persecutions had been. When the Crusades had opened a way to the middle of Europe, different companies of

this sect passed as pilgrims from the Holy Land up the Danube, and entered Italy with the Levant trade through Venice. The Vaudois and Albigeois sects (Waldenses and Albigenses) are said to have sprung from this stock. Such is the account given of them by Photius and Petrus Siculus, but a different view has been taken by modern ecclesiastical historians, as Neander, Gieseler, and others. According to these writers the sect was founded by one Constantine of Mananalis (near Samosata), who, having received a present of two volumes, one containing the Gospels and the other the epistles of St. Paul, conceived so great a veneration for the apostle of the Gentiles that he assumed his name; and so well did he communicate this feeling to his followers, that they adopted the names of the revered apostle's friends, such as Timothy, Tychicus, &c. They rejected the adoration of the Virgin and the saints, and refused homage to the cross; they denied the validity of the sacraments, interpreting spiritually baptism and the Lord's supper; would not recognize any priestly dignity; and their public worship was altogether free from ritual. They had nothing in common with Manichæan fatalism, and the charge of having founded their doctrines upon Manichæism was falsely brought against them by their enemies. A remnant of this sect is said by a modern Greek historian to have existed at Philippopolis about the beginning of the present century.

PAUL OF VENICE, a celebrated ecclesiastic and historian of the sixteenth century, whose proper name was Pietro Sarpi, was born at Venice, Aug. 14, 1552, and was the son of a merchant of that city. He entered young into the religious order of the Servites, and in his twentieth year was appointed chaplain to the Grand-duke of Mantua, and lecturer on the canon law. After two years he returned to Venice, and became provincial of his order. He was afterwards made Procurator-general of the Servites. A treacherous correspondent having betrayed a letter of Father Paul, in which he had observed that so far from coveting the dignities of the court of Rome he held them in abomination, brought on him the imputation of being a heretic, while his liberal intercourse with eminent Protestants contributed to increase the prejudices thus excited. In a dispute between the pope and the Venetian government on the subject of ecclesiastical immunities Father Paul showed himself a strenuous advocate for the cause of liberty, and was summoned to Rome, on pain of excommunication, to answer for his conduct; but the affair was compromised. To the vengeance of his political enemies may be attributed an attempt to assassinate him in 1607, on which occasion he received many dangerous wounds from a band of ruffians. Father Paul employed the latter part of his life in writing the history of the Council of Trent, in which he has developed the intrigues connected with the transactions of that famous assembly, with a degree of boldness and veracity which renders the work one of the most interesting and important productions of the class to which it belongs. The labours of Father Paul extended to various branches of knowledge; he was deeply skilled in the canon law, and distinguished for his acquaintance with anatomy. He appears to have discovered the valves of the veins which contribute to facilitate the circulation of the blood. He died January 14, 1622, and is said to have expired after uttering the words *Esto perpetua*, which have been construed as a prayer for the prosperity of Venice. The history of the Council of Trent was first published in London in 1619, having been transmitted to this country through the medium of the British resident at Venice, Sir Henry Wotton, a personal friend of the author. This work is strongly anti-papal, nay, even rationalistic in tone, and was answered by a voluminous work on the same subject by the Jesuit Pallavicino. The works of Father Paul were printed at Verona, 1761 (eight vols. 4to), and at Naples, 1790 (twenty-four vols. 8vo).

PAUL'S (ST.) CATHEDRAL, London, the largest Protestant church in the world, is situated on Ludgate Hill, an elevation on the north bank of the Thames. The site of the present building was originally occupied by a church erected by Ethelbert, king of Kent, in 610. This was destroyed by fire in 1087, and another edifice, Old St. Paul's, was shortly afterwards commenced. The structure was in the Gothic style, in the form of a Latin cross, 690 feet long, 130 feet broad, with a spire rising to the height of 520 feet. Near the north-east end stood Powle's Cross, often alluded to in our early literature, and a pulpit where sermons were preached and Papal mandates read aloud to the people. The middle aisle was termed Paul's Walk, from its being frequented by idlers as well as money-lenders and general dealers. A carpenter and a wine merchant took possession of part of the vaults, trunk-makers of the cloisters; buildings were planted against the outer walls, one being used as a theatre, and in another the occupant made a hole in a buttress, in which he baked his bread. Old St. Paul's was much damaged by a fire in 1137, by lightning in 1444, again by fire in 1561, and was utterly destroyed by the great fire in 1666. The ruins remained pretty much as they had been left by the fire for about eight years, when the rebuilding was taken in hand by the government of Charles II. The first stone was laid June 21, 1675. In ten years the walls of the choir and of the side aisles were completed, together with the circular porticoes on the north and south sides. The last and highest stone of the building was placed upon the summit of the lantern in 1710, and soon after the queen and the two houses of Parliament attended service in the church. The whole building was completed at a cost of £747,954 in thirty-five successive years, under one architect (Sir Christopher Wren), one master-mason (Thomas Strong), and one Bishop of London (Dr. Henry Compton). The building is of Portland stone, in the form of a Latin cross. Its length is 500 feet; the width of the nave and choir, 125 feet; the length of the transept, 250 feet; the general height is 100 feet. Two rows of massy pillars divide the interior into a nave and side aisles. The west front towards Ludgate Street is very noble. The elevated portico forming the grand entrance consists of twelve Corinthian columns, with an upper portico of eight pillars of the composite order, supporting a triangular pediment. The entablature represents in relief the conversion of St. Paul, a work of Francis Bird. Two turrets adorn the north-western and south-western angles of the cathedral. Upon the south front, which corresponds with the north, is a phœnix rising from the flames, with the motto, 'Resurgam' (I shall rise again). The dome is one of the most remarkable points of sight in the view of London, and is one of the noblest structures of the kind in the world. It is surmounted by a lantern carrying a gilt copper ball and cross, the top of which is 356 feet above the floor of the church. But the interior decoration of this building does not correspond with its exterior magnificence. The pavement is composed of slabs of black and white marble joined in the manner of a large chess-board, increasing thereby the feeling of vacancy which vast walls left utterly devoid of ornament naturally excite. The most favourable view of the interior is from the whispering gallery, in the lower part of the dome. Sir James Thornhill's paintings, illustrative of the most remarkable occurrences in the life of Paul, can be seen to most advantage from this situation. The

great bell is tolled only on the death of some member of the royal family, of the lord-mayor, of the Bishop of London, and of the dean of the cathedral. You reach the ball by 616 steps. To break the uniformity of the interior it was suggested in 1790 to erect in the interior monuments and statues to the illustrious dead. The first was in memory of John Howard (1796). The monument of Nelson, who is buried in a tomb in the middle of the building, is the work of Flaxman. There are monuments also to Earl Howe and Sir Joshua Reynolds by the same sculptor; statues of Generals Bowes and Gillespie and of Bishop Heber, by Chantrey; and monuments to Lord Rodney, Lord Heathfield, Admiral Collingwood, General Abercrombie, Duke of Wellington, &c., by Rossi, Westmacott, and others. Over the entrance to the choir is a marble slab with this inscription in Latin, 'Here reposes Christopher Wren, the builder of this church and city, who lived for more than ninety years, not for his own but for the public good. Reader, dost thou seek his monument? Look around thee.' It has been in contemplation for some time past to execute considerable alterations and adornments on the exterior and in the interior of the cathedral, and a large sum of money has been collected for this purpose; but the plans hitherto exhibited have failed in giving universal satisfaction, on account of their reputed tawdriness, inefficiency, and unnecessary expense.

PAULUS ÆGINETA, a celebrated Greek medical writer, was born in the Island of Ægina; the date of his birth has been variously stated, some putting it as early as the fourth, and others as late as the beginning of the seventh century. From his own writings we learn that he was connected with the medical school of Alexandria, but whether as teacher or student we know not. He appears to have travelled in Greece and other countries, but little more is known of his life. Although he can hardly be classed among the greatest original medical writers, he is not to be considered a mere copyist. He abridged the works of Galen, and was deeply read in those of Hippocrates, Ætius, and Oribasius, but always submitted their conclusions to the test of his own experience. His works, the most important of which is generally known as De Re Medica Libri Septem, have been frequently published; the first Greek text appeared at Venice in 1528, a good Latin edition at Paris in 1532, and an English translation by Francis Adams (London, 1844–47, three vols. 8vo).

PAULUS DIACONUS (that is, 'Paul the Deacon'), also called WARNIFRIDUS, and PAULUS MONACHUS (Paul the Monk), was born of a noble family at Friuli about 730, and was educated in the court of the Lombard kings at Pavia. On the capture of Desiderius, the last king of the Lombards, by Charlemagne, he retired to the monastery of Monte-Casino, where he took the habit. In 781 he was called to the court of Charlemagne, and was one of the principal instruments of the intellectual reforms effected by the emperor in the countries of Western Europe. Paulus drew up a book of homilies from the fathers, which was in general use throughout Europe during the middle ages. He also wrote a history of the bishops of Metz—Gesta Episcoporum Mettensium—which is to be found in the second volume of Pertz's Monumenta Germaniæ Historica. In 787 he returned to his monastery at Monte-Casino, and spent the rest of his life in religious and literary labours. Here he wrote his history of the Lombards (De Gestis Longobardorum Libri VI.), his principal work. It is written in a lucid and elegant style, and is prized for its general truthfulness; it contains a mass of information elsewhere unattainable. It commences with the migration of the Lombards from Scandinavia to the death of King Liutprand. The best edition is contained in Muratori's Rerum Italicarum Scriptores.

PAUL VERONESE. See CAGLIARI.

PAUSANIAS, a Lacedæmonian general, son of Cleombrotus, regent of Sparta, and nephew of Leonidas. He was appointed guardian of his cousin Plistarchus, the son of Leonidas, during his minority, and in this capacity he commanded the allied Greeks at the battle of Platæa. To himself alone he ascribed the victory, and on the golden tripod offered by the Greeks in the Temple of Apollo at Delphi he placed an inscription, which the Lacedæmonians subsequently replaced by the names of the allied states, representing himself as the sole conqueror. He became still more insupportable after having, at the head of the allied Greek fleet, delivered the Grecian cities, and after a long struggle Cyprus also, and finally Byzantium itself, the key of Asia Minor, from the Persian yoke. At length he entered into secret negotiations with Xerxes, and conceived the design of making himself master of Greece. He even adopted Persian habits and costume, and carried things so far that the disgust of the allies could no longer be suppressed, and they offered to Athens the superiority which had hitherto been recognized in Sparta. The Spartans summoned him home; but hardly was he acquitted in consideration of his rank and services when he betook himself again to Byzantium, under the pretence of taking part in the campaign. Being compelled by the Athenians to leave the city, he went to Colonæ in Troas, and entered into fresh negotiations with the enemies of Greece. He was once more recalled and imprisoned; but notwithstanding the charges against him, was again liberated under promise to appear whenever he should be summoned. But he entered into new negotiations with the Persian king. The ephori now determined to punish him according to the rigour of the law. Pausanias having been informed of the fate which awaited him, took refuge at the feet of Athena Chalciœcus. But his indignant mother, it is said, brought the first stone to close the entrance of the temple. The people followed her example, and the unhappy prisoner, being thus walled up, died of hunger. He was buried before the temple, and the anger of the goddess at the violation of her temple was appeased by the erection of two bronze statues. His death took place between B.C. 471 and 466.

PAUSANIAS, a Greek topographical writer who flourished during the reigns of the Antonines. Nothing is known of him but from his writings. His Hellados Periēgēsis is an itinerary of his travels, which were extensive. It is in ten books, the eighth of which appears to have been written about 174. He appears to have visited all the most important places in Greece. He describes Attica, Megaris, Corinthia, Sicyonia, Laconica, Messenia, Achæa, Bœotia, &c. He appears also to have visited Rome, Syria, and Palestine. Pausanias is supposed to have been a native of Lydia. His style is said to be Asiatic, and it is not that of the best Greek writers. His account of Greece describes temples, theatres, tombs, statues, pictures, monuments of every sort. It is a valuable work for the antiquarian and historian. He also mentions mountains, rivers, and fountains, and the mythological stories connected with them. He appears to have been a profound believer in mythology, and relates the various legends belonging to it in all good faith. His observation is accurate, and his descriptions simple and practical, so that the fullest confidence may be put in him where he speaks as an eye-witness. His work has been edited by Kühn (Leipzig, 1696, folio), Facius (Leipzig, 1794–97,

4to), Sibelis (Leipzig, 1822, four vols.); the latest edition is that of Dindorf (Paris, 1845). The French translation by Clavier and others (Paris, 1814–23) contains the Greek text and notes in six vols. We have an English translation by Taylor.

PAUSILIPPO, a hill near Naples, with a large and beautiful grotto (*la grotta di Pausilippo*). This is a straight passage cut through the rock from Naples to Puzzuoli; the height, about 70 feet at the entrance, is unequal; breadth, 21 feet; length, 2244 feet. Through this grotto formerly passed the daily travel of a very populous district. It is so situated that the rays of the setting sun penetrate it in February and October from one end to the other. Strabo assigns the work to Cocceius, and as a person of this name was superintendent of aqueducts under Tiberius, this would give it a comparatively late origin, its existence being frequently held to be altogether anterior to the time of the Romans. It was subsequently made broader and higher, paved, and provided with two air-holes. The whole rock is firm, and has never been shaken by earthquakes. In the centre there is a chapel of the Virgin Mary; over the grotto are the remains of an aqueduct and of what is called Virgil's Tomb. In the year 1822 the Austrian troops constructed a road over the Pausilippo to Puzzuoli, by which the passage through the grotto is avoided. In the course of this work a grotto was found at the summit of the Pausilippo, which is probably the *crypta Pausilypona* of the ancients, the name which is now given to what Seneca called the *crypta Neapolitana*.

PAVEMENT. The general use of pavement for streets is comparatively recent. No large European city, Rome only excepted, had paved streets till towards the twelfth or thirteenth century. More mention is made in the ancient authors of paved highways than streets, which Beckmann, in his History of Inventions, ascribes, however, to the simple circumstance that the latter were probably paved by the citizens, each taking the part before his own house, so that the government was not required to make provision for this purpose. Isidore says that the Carthaginians were the first people who had paved streets, which were soon imitated by the Romans; but long before that time Semiramis paved highways, as her own vainglorious inscription, preserved by Strabo, asserts. At Thebes in Bœotia the streets were under the care of telearchs, who provided for repairing and cleaning them. Epaminondas's being appointed to the office rendered it honourable and sought for, whilst before it had been contemned, and for that very reason given to that great general. Jerusalem seems not to have been paved in the times of Agrippa, according to Josephus. When Rome was first paved is not exactly ascertained, though many antiquarians consider it to have been in the year of the city 578, according to a passage of Livy, which admits, however, of several explanations. The ædiles at first had the superintendence of the streets, at a later period particular officers called *curatores viarum*. Pavements of lava, with elevated side-walks, are found at Herculaneum and Pompeii. Of modern cities Paris is generally mentioned as having the oldest pavement; but it is certain that Cordova in Spain was paved about 850 A.D. by Abderrahman II., who also brought water to the city in leaden pipes. Paris was not paved in the twelfth century, for Rigord, physician and historian of Philip II., tells us that the king, standing at his window, and disgusted with the dust and dirt thrown up by the vehicles, resolved to pave the street, for which orders were issued in 1184; and this is confirmed by several historians. It is certain that many streets of Paris were not paved even in 1641. All historians allow that London was not paved at the end of the eleventh century. It is not certain when it was first paved; probably the paving took place by degrees. Holborn was first paved in 1417, the great Smithfield Market not until 1614.

Street pavements of stone in modern cities are laid upon a uniform principle. Unless the natural foundation is sufficiently solid a bed of concrete is laid, sloping to the sides, to allow the water to run off. Upon this is placed the pavement, which consists of blocks of granite, trap, or other stone of hard and solid texture, of 1 or 2 feet in length, 6 or 7 inches in breadth, and 10 or 12 in depth. The interstices are filled with sand and grouted with lime. Cementing with mortar is not commonly used, although it would render the pavement more durable, on account of the frequency with which the pavement in towns has to be lifted. Arbroath and Caithness supply the best paving-stones. Asphalt pavements are frequently used for side-walks, and have also been introduced for street pavements. They are comparatively noiseless, but are somewhat dangerous for horses, being remarkably slippery in wet weather. They are also liable to become soft in hot weather. Concrete pavement is composed of broken stone, &c., mixed with tar or asphalt. Liquid iron asphalt (Barnett's) is pulverized iron-ore mixed with asphalt and mineral tar. It is laid on over concrete to a thickness of 2 inches. Improved wood-pavements have recently been introduced experimentally in London and other cities. They lay claim to great advantages, as noiselessness, elasticity, durability, uniformity of surface, with freedom from slipperiness; but time has not yet been afforded for testing them thoroughly. They are laid on a bed of sand of sufficient depth to afford a good grade, say from 1 to 2 inches; on this is laid a flooring of two thicknesses in parallel lines, the upper layer of boards transversely to the lower. Upon these are laid the blocks which form the pavement, and the size of which is $9 \times 3 \times 5$ inches. The blocks are placed on their ends, so that the cross surface of the wood is exposed. To steady the blocks during construction a strip of wood $1 \times \frac{3}{4}$ inch is laid between each row of them, and nailed to the flooring. The spaces between the blocks are then filled with hot gravel, upon which hot tar or pitch is poured, and the whole rammed home tight. This process is repeated until the spaces are filled to the level of the wood; the surface is then spread over with tar, and covered with a layer of fine gravel.

PAVIA (anciently *Ticinum*), a city of Italy, in Lombardy, 19 miles S.S.W. of Milan, capital of a province of the same name, beautifully situated on the left bank of the Ticino, which is here crossed by a bridge of eight arches, and about 2 miles below the town falls into the Po. The bridge, of stone and brick, is covered with a curious roof supported by 100 granite pillars. Pavia is surrounded by ancient walls, which have a circuit of about 3 miles, inclosing a far larger space than its present inhabitants require, and giving it, in connection with numerous palaces, either ruinous or untenanted, a deserted and melancholy look. It consists of a principal street, called the Strada Nuova, or Corso, which traverses it centrally, contains its most important edifices, and constitutes its great thoroughfare; and of a great number of minor streets, placed at right angles to the Corso, and occasionally opening into squares. Of the ecclesiastical edifices the most important are the cathedral, a large, heavy, unfinished structure, crowned with a lofty dome, remarkable chiefly for the air of gloom thrown around it, giving its interior the appearance of a vast cavern above ground, but containing some good paintings, and a beautiful side chapel, with the tomb of St. Augustine; San Michele, a

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SILIPPO, a hill near Naples, with a beautiful grotto (*la grotta di Posilipo*). The ancient passage cut through the rock from Naples to Pozzuoli; the height, about 70 feet at the entrance, is unequal; breadth, 21 feet. Through this grotto formerly passed the principal road from the populous district. It is a short distance from the tomb of Virgil. The finest time for visiting the grotto is October from one end to the other. The work to Cocceius, and was superintendent of his would give it a large sum of money, the sentence being frequently half a year or more. In the year 1807 the Romans made a road over the hill by other than the ancient passage through the grotto. Under sixteen years of age, on Sunday, and at the Festival of the Purification of the Virgin Mary, prohibition to give in pledge on Christmas-day and New Year's Day. Unlawful pawning is punishable by imprisonment to a sum not exceeding £10. If a person offers pawning a satisfactory account of how he became possessed of the article without title, he is to be apprehended, and handed over to justice, and dealt with according to law. Articles pawned to another by the pawnbroker, &c., cannot be pawned; and the pawnbroker taking such goods, obtain a loan on the premises. The pawnbroker's licence, expiring on 31st July, which may be forfeited for fraud or disorderly conduct. Offences against the act are punishable by a penalty not exceeding £10.

town, United States, Providence Island, on both sides of the Blackstone (30 feet high) of the same name, 43 miles from Boston to Providence and 44 from Worcester. It occupies a pleasant site, and has churches, numerous and extensive cotton-mills, iron-works, and machine-shops; considerable manufactures of boots, shoes, carriages, furniture, cabinet-wares; building-yards, and an extensive trade. The first factory for weaving cotton by water-power in the United States was erected here in 1790. Pop. in 1870, 6619; in 1880, 19,030.

anciently *Paxos*), one of the Ionian Islands, belonging to Greece, 9 miles south of Corfu. It is about 7 miles long and 2 broad, and consists of a single limestone rock. Principal product, olive-oil of the finest quality. Pop. 3582.

TON, SIR JOSEPH, a celebrated English landscape-gardener and architect, was born at Milton Bryant, in Bedfordshire, in 1803. He was educated at the free school of Woburn, and being the son of poor parents had to earn a livelihood by his own exertions at an early age. He became a gardener, and was employed in the Horticultural Society's gardens at Chiswick. While there he happened to attract the notice of the Duke of Devonshire, who made him head-gardener at his seat of Chatsworth, Derbyshire, and latterly manager of all his estates in the county. In 1838 he published a Treatise on the Culture of the Dahlia, and in 1840, in conjunction with Lindley, a Pocket Botanical Dictionary. The great Conservatory at Chatsworth, 300 feet long by 145 wide, built from his designs, no doubt suggested to him the idea of the Crystal Palace, the magnificent structure of iron and glass planned by him for the great Exhibition of 1851. It was built in Hyde Park, London, and when completed excited universal admiration. Paxton became at once famous, and received the honour of knighthood. The Crystal Palace was removed, and under his direction rebuilt with great additions at Sydenham, where, with its grounds, also laid out by him, it forms one of the chief attractions of the metropolis. He was elected member of Parliament for Coventry in 1854, and continued to represent it till his death, which took place, 8th June, 1865, at his residence, Rockhills, Sydenham.

PAYMASTER, an officer in the British army and navy. In the army there is a regimental paymaster for each battalion of infantry and each regiment of cavalry, who holds the rank of captain, or after lengthened service of major. He has to pay the officers and the men through their respective captains. In matters of general discipline the paymaster is subordinate to the commanding officer of his regiment; but in regard to the immediate duties of his office he is directly responsible to the war-office. There are also paymasters for the various regimental districts, as well as for the larger military divisions of the country. The paymaster of a ship in the navy has a general charge of the financial department in the vessel, and of the provisions as well as of the payment of the men. Until 1844 he had the title of purser.

PAYMASTER-GENERAL, a British government officer whose duties were formerly limited to the army, but who now acts as paymaster-general of all the services. The office was formerly lucrative, as the interest of the money which remained in the hands of the paymaster formed part of its emoluments. It was limited in 1782 to a fixed salary. It is now usually attached to the vice-presidentship of the board of trade, with a salary of £2000. The paymaster-general is *ex officio* a privy-councillor. Formerly he was sometimes a member of the cabinet.

PAYS DE VAUD. See VAUD (CANTON OF).

PAZ (LA) DE AYACUCHO, a city of Bolivia, capital of a department and a province of the same name, stands in a deep ravine, the Quebrada-de-Choquehapu, 620 feet below the level of the Lake of Titicaca, yet 12,195 feet above sea-level; lat. 16° 29′ 54″ S.; lon. 68° 29′ 38″ W. The ravine of La Paz descends south-east; the stream which flows through it, from and round Illimani, the snowy summits of which are seen east by south, is one of the chief sources of the Amazon. The city is built in an amphitheatre on both sides of the ravine; but the public edifices are chiefly on the left bank. Nine fine bridges unite the two quarters, each of which is subdivided into several other sections by deep ravines. Of the churches the Sagrario or cathedral claims most attention, being large, and effectively, though somewhat coarsely, ornamented with figures of angels executed in basalt. Opposite to the cathedral is the Plaza Major or principal square. There are also a college of sciences, a seminary, a school of mechanical arts, a university, and an academy of jurisprudence. Nine-tenths of the inhabitants are Aymara Indians, whose national costume, as well as language, prevail in it. The foundation of Nuestra Señora de la Paz dates from 1548. The town being situated conveniently between the fertile valleys of the Yungas and the port of Arica, soon rose to importance. In 1605 it was made

heavy marble edifice, apparently of Lombard origin, and supposed to belong to the sixth or seventh century; Santa Maria del Carmine, an enormous Gothic church of imposing exterior, built in 1373, and possessed of good pictures; Incoronata, or Santa Maria de Canepanova, in the *cinque-cento* style, by Bramante; and San Francesco, built of the finest brick-work, and presenting a beautiful specimen of pure Italian Gothic. The only other edifices particularly deserving of notice are the Castello, erected by Galeazzo Visconti, 1460–69, on the site of the old palace of the Lombard kings, once celebrated for its grandeur and magnificent collections, but now only a gloomy ruin, partly fitted up as a barrack; the theatre, and several towers, once so numerous that Pavia was surnamed 'the city of the hundred towers.' Of the few still existing those of Belcredi and Maino are the most conspicuous, and are each about 190 feet high. The university, founded, it is said, by Charlemagne, is one of the oldest in Italy, and in its palmiest days, about the beginning of the sixteenth century, was attended by about 3000 students. In 1882 the students numbered 724. The buildings which it occupies have little to recommend them beyond their size, and the regularity of their construction; but the library of about 130,000 volumes is valuable, and the collections include, among others, one of the best anatomical museums in existence. Besides the university, there are three colleges connected with it, a gymnasium, an ecclesiastical seminary, a school of painting, a school of design and sculpture, an institute of fine arts, &c. Beyond the walls, but connected with its educational establishments, are botanical and agricultural gardens. The chief charitable endowments are a large and well-endowed general and two orphan hospitals. Pavia has not a single manufacture of any importance, and its traffic is almost solely confined to the supply of its own local wants.

Pavia was a place of considerable importance during the reign of Augustus. It afterwards came into the possession of the Lombard kings, who made it their capital, and erected many edifices, more remarkable for magnitude than taste. Near it, on 24th February, 1525, the Imperialists defeated the French, and took their king, Francis I., prisoner. Pavia has given birth to many distinguished men, among whom are Pope John XIV., and Lanfranc, afterwards Archbishop of Canterbury. Pop. 29,836.—The province of Pavia, which extends on both sides of the Po, has an area of 1285 square miles. The district of Bobbio is entirely covered by the Apennines, that of Voghera partly so. Those of Lomellina and Pavia form a fertile plain. Pop. (1881), 469,831.

PAVILION, at Brighton, England, a building erected in 1784 for the then Prince of Wales. It was a favourite residence of George IV., and its name sometimes occurs in connection with important measures agitated there. See BRIGHTON.

PAVLOGRAD, a town, Russia, 16 miles north-east of Ekaterinoslav, and in the government of that name. It is mostly built of wood. Pop. 11,391.

PAWNBROKERS. The business of a pawnbroker is to lend money on pledges. Although this mode of borrowing is occasionally taken advantage of by all classes, and bankers, when they accept security for their advances, act on the same principle as the pawnbroker, the business, as a special one, originates chiefly in the necessities of the poor. The usury and other abuses to which the necessities of borrowers of this class are liable to give rise has led, on the Continent, to the establishment of charitable institutions (see MONT DE PIÉTÉ), where the business is conducted on benevolent principles. In this country, where everything seems to flourish best under private management, the same plan has been tried, but it has failed. The trade of a pawnbroker may be thus said, in a sense, to be peculiarly a British institution; but the object which has been aimed at by monts de piété has here been attempted to be accomplished by placing the trade under certain legal restrictions.

In the middle ages lending upon pledges was a trade exclusively pursued by Jews and Lombards. In France, before the establishment of monts de piété, the trade was regulated by law. During the revolution the monts de piété were at first abolished as a monopoly, but the abuses to which the restoration of private pledging gave rise soon led to their re-establishment and the prohibition of private pledging, which is still maintained.

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heavy marble edifice, apparently of Lombard origin, and supposed to belong to the sixth or seventh century; Santa Maria del Carmine, an enormous Gothic church of imposing exterior, built in 1373, and possessed of good pictures; Incoronata, or Santa Maria de Canepanova, in the *cinque-cento* style, by Bramante; and San Francesco, built of the finest brick-work, and presenting a beautiful specimen of pure Italian Gothic. The only other edifices particularly deserving of notice are the Castello, erected by Galeazzo Visconti, 1460–69, on the site of the old palace of the Lombard kings, once celebrated for its grandeur and magnificent collections, but now only a gloomy ruin, partly fitted up as a barrack; the theatre, and several towers, once so numerous that Pavia was surnamed 'the city of the hundred towers.' Of the few still existing those of Belcredi and Maino are the most conspicuous, and are each about 190 feet high. The university, founded, it is said, by Charlemagne, is one of the oldest in Italy, and in its palmiest days, about the beginning of the sixteenth century, was attended by about 3000 students. In 1882 the students numbered 724. The buildings which it occupies have little to recommend them beyond their size, and the regularity of their construction; but the library of about 130,000 volumes is valuable, and the collections include, among others, one of the best anatomical museums in existence. Besides the university, there are three colleges connected with it, a gymnasium, an ecclesiastical seminary, a school of painting, a school of design and sculpture, an institute of fine arts, &c. Beyond the walls, but connected with its educational establishments, are botanical and agricultural gardens. The chief charitable endowments are a large and well-endowed general and two orphan hospitals. Pavia has not a single manufacture of any importance, and its traffic is almost solely confined to the supply of its own local wants.

Pavia was a place of considerable importance during the reign of Augustus. It afterwards came into the possession of the Lombard kings, who made it their capital, and erected many edifices, more remarkable for magnitude than taste. Near it, on 24th February, 1525, the Imperialists defeated the French, and took their king, Francis I., prisoner. Pavia has given birth to many distinguished men, among whom are Pope John XIV., and Lanfranc, afterwards Archbishop of Canterbury. Pop. 29,836.—The province of Pavia, which extends on both sides of the Po, has an area of 1285 square miles. The district of Bobbio is entirely covered by the Apennines, that of Voghera partly so. Those of Lomellina and Pavia form a fertile plain. Pop. (1881), 469,831.

PAVILION, at Brighton, England, a building erected in 1784 for the then Prince of Wales. It was a favourite residence of George IV., and its name sometimes occurs in connection with important measures agitated there. See BRIGHTON.

PAVLOGRAD, a town, Russia, 16 miles north-east of Ekaterinoslav, and in the government of that name. It is mostly built of wood. Pop. 11,391.

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of *decuriæ*, which were established for representative and military purposes. The gens, all the members of which bore the same gentile name, sent its leader to the senate, so that the number of senators for the three tribes amounted to 300. During the time of the republic distinguished foreigners and wealthy plebeians were occasionally made patricians. When the plebeians became a distinct order the patricians became a real aristocracy of birth, and occupied all the civil and religious offices. No matter how poor he was there was no power could make a patrician a plebeian, unless he, of his own accord, left his gens and curia, and gave up its obligations and privileges. On the other hand, no plebeian, however wealthy, could become a patrician, except in accordance with a *lex curiata*, or law of the curiæ, and this was seldom passed. About the close of the republic the number of patrician families had diminished to fifty. Julius Cæsar, Augustus, and succeeding emperors found it necessary to raise plebeian families to the patrician rank. During the first centuries of the republic there was an almost uninterrupted struggle between the patricians and plebeians, in which the former fought hard to retain their exclusive rights, but which ended in the establishment of the political equality of the two orders; only a few insignificant offices remained the exclusive privilege of the patricians. The formation of a new aristocracy, founded on wealth and on the holding of the offices of consul, prætor, and curule ædile, made the patricians of still less account. During the empire the Roman citizens were divided into the two classes of populus and patricii. The conquest of Rome by the Goths, which deprived many of the patricians of their liberty or their lives, or compelled them to flee to Constantinople, led to the abolition of all distinction between patricians and plebeians. When the seat of government was removed to Constantinople, Constantine the Great, desirous of restoring the ancient Roman ranks, instituted a new patrician dignity, which was a mere personal title, and which could be acquired only by high birth and distinguished merits. Under the Carlovingians and the succeeding emperors the title of patrician denoted an exalted rank, and was connected also with the government of Rome and its provinces, and the support of the Papal see. Charlemagne assumed the title of a Roman patrician before he was declared emperor, and Henry IV., as such, deposed Pope Gregory VII. In modern times a few noble families in the imperial cities were called patricians, because they were especially entitled to certain high offices. In some Italian cities the title of patrician is still used to denote a member of the nobility.

PATRICK (Patricius), St., the apostle of Ireland, was born, according to some authorities, in 372, and to others 377 or 387. His birth-place is equally a matter of uncertainty. From his Confessions we learn that his father, Calpurnius, descended from a Breton family, had served as a decurion in the Roman army, and possessed a farm near Bonavem Taberniæ, which is supposed by some to be near the site of Boulogne-sur-Mer, and by others at the place called after him, Kilpatrick, in Dumbartonshire. His mother, according to some ancient biographers, was called Conches or Conchessa, and is said to have been a sister of the Bishop of Tours. At the age of sixteen Patrick (or rather Succath, for such was his name previous to his setting out on his great mission) was carried off from his father's farm by a band of pirates, who sold him to an Ulster chief named Milhu, whose flocks he tended for six years. At the end of that period he made his escape, and went to France, where he became a monk, residing for some time at Tours, and afterwards in the famous monastery of Lerins. Here he did not remain long, for, as he tells us in the work already alluded to, he was moved by visions to undertake the conversion of the Irish to Christianity. Having been ordained a bishop and received the Papal benediction from Celestine I., he went over to his chosen field of labour about the year 432. Here he is said to have founded over 360 churches, baptized with his own hand more than 12,000 persons, and ordained a great number of priests. He fixed his see at Armagh about the year 454. Many miracles are ascribed to him, particularly the extirpation of all venomous creatures in the island. The date of his death is variously set down at 460 and 493; it took place at a place called Saul, near Downpatrick, and his relics were preserved at Downpatrick till the time of the Reformation; the place is still venerated by the Irish. His authentic literary remains consist of his Confessions and a letter addressed to a Welsh chief named Corotic, both written in barbarous Latin, but of considerable historical value. These, with several other productions ascribed to him, were published in Wilkins's Concilia, and separately by Ware in 1656. A biography of the saint was published by Dr. Todd (one vol. 8vo, Dublin, 1863).

PATRICK, St., Order of, an Irish order of knighthood, instituted in 1783 by George III., originally consisting of the sovereign, the lord-lieutenant of Ireland for the time being (who is the grandmaster of the order), and fifteen knights; but by a statute in 1833 the order was enlarged and the number of knights raised to twenty-two. The insignia of the order are a gold collar, composed of red and white enamelled roses alternating with harps bound together with knots of gold; in the centre is an imperial crown, surmounting a gold harp, from which is suspended the badge, which is also of gold and oval in shape; in the centre of the badge is the cross of St. Patrick, surmounted by a shamrock, the leaves of which bear an imperial crown; round this is a blue enamelled band bearing the motto 'Quis separabit.' The star differs from the badge in being circular instead of oval in shape. The mantle and hood are of sky-blue tabinet, lined with white silk.

PATRIMONIUM PETRI (Patrimony of St. Peter) is the name of a former administrative division of the Papal States, consisting chiefly of the territory given to the pope by Matilda, countess of Tuscany, in the twelfth century. It corresponds to what was the modern delegation of Civita Vecchia, and the north-west part of the comarca di Roma.

PATRISTIC THEOLOGY (*Theologica Patristica*), that branch of historical theology which is particularly devoted to the lives and doctrines of the fathers of the church. In the beginning of the present century the German Protestants paid particular attention to it, as affording a satisfactory, though laborious way of arriving at the history of the Christian doctrine and constitution in the first six centuries. See Engelhardt, Leitfaden zu patristischen Vorlesungen (Erlangen, 1822); Möhler, Patrologie, edited by Reithmayr (vol. i. parts 1 and 2, Ratisbon, 1839–40).

PATROCLUS, the friend of Achilles, was the son of Menœtius, one of the Argonauts, and of Sthenele or Polymela. He accidentally killed Clysonymus, the son of Amphidamus, in a game of dice at Opus. His father saved him by flight, and carried him to Peleus, by whom he was kindly received and educated as the companion of his son. He accompanied Achilles to Troy, and remained, like him, inactive, when the anger of Achilles prevented him from taking a part in the war. At length the necessity of action seemed so urgent that Achilles permitted Patroclus to go to the war, arrayed in his own armour. His success was at first brilliant; but, Apollo having stunned him and rendered him defenceless, he was slain by Euphorbus and Hector. The Greeks re-

rovered his body, which they interred with the highest marks of honour, and established solemn funeral games to his memory. Achilles then resolved to avenge his friend, and to accompany him in death.

PATROL, in war, a round or march made by the guards or watch in the night time, to observe what passes in the streets, and to secure the peace and tranquillity of a garrison, city, or camp. The patrol generally consists of a body of five or six men, detached from a body on guard, and commanded by a sergeant.

PATRON, in general, a protector. The Latin *patronus* signified, in the Roman Republic, a patrician who had plebeians, called *clients*, under his immediate protection, and whose interests he supported by his authority and influence. (See CLIENT.) *Jus patronatus* signifies in the Roman law the right which a master retains over a freed slave. When Rome had reduced many nations under her yoke, noble Romans were sometimes the patrons of whole cities and provinces, and such patronage even descended by inheritance in some families. Thus the patronage over the Lacedæmonians was vested in the family of the Claudii, that of the Sicilians in the family of the Marcelli—an arrangement which, in so crude a state of politics, was not without beneficial consequences. Patron was also the title of every advocate who represented the interest of another, his client (*patronus causarum*). In later times the term patron was applied to every protector or influential promoter of the interests of others; hence the saints who were believed to watch over the interests of particular persons, places, or trades were called patron saints.

PATRONAGE, ECCLESIASTICAL, the right of presenting a fit person to a vacant benefice. In the earlier ages the bishops appointed the holders of all benefices, but as Christianity became more universal the means of divine worship supplied by the bishoprics, monasteries, and occasional episcopally endowed churches were found inadequate for the wants of the people, and the proprietors of lands began to erect and endow churches in their own possessions. A district was specified by the founder within which the functions of the priest were to be exercised; the priest received for his maintenance and for the use of the church the whole or part of the profits of the lands with which the church was endowed and the offerings of those who worshipped in it. As these private endowments tended to the advancement of religion and lessened the demands made upon the episcopal treasury the bishops gave them every encouragement, consenting that the incumbent should be resident at the church, receive the tithes and offerings of the people of the district, and what endowment had been annexed to the church; and eventually the privilege was accorded to the founders and their heirs of nominating a person in holy orders to be the officiating clergyman on the occurrence of vacancies. In addition to the right of presentation the patron had in former times a pre-eminent seat and burial-place in the church; his name and arms were engraved on the church and on its bells; he had a right of precedency among the clergy in processions, the disposal of the fruits of the benefice during a vacancy, and his consent was necessary to the validity of leases or feus by the incumbent. For a length of time not only the nomination but also the investiture of the clergy were in the hands of laymen; this roused the indignation of several successive popes and councils. Adrian IV. (1154) appears first to have prayed, requested, and at last commanded the ordinaries or superiors of the benefices to confer benefices by his recommendation. Alexander III. (1159) not only issued such mandates, but sent officers to see to their enforcement. Innocent III. first asserted for the supreme pontiff the plenary power of disposing of all benefices for the advantage of such persons as should have deserved well of the church. Clement IV. (1265) reserved to himself all benefices of which the possessors died at Rome. Clement V. (1305) systematized the practice of holding benefices *in commendam* (see COMMENDAM), dispensing with the canons against pluralities and non-residence. John XXII. (1316) not only extended the special reservation to whole dioceses, but proclaimed the Papal reservation of all benefices vacated by promotions through the grace of the Roman see and of all bishoprics in Christendom. By means of these decrees upwards of fifty benefices were often held by one person, and all the principal benefices in Europe were filled by Italian ecclesiastics, Papal nominees who were often ignorant of the language of their flocks. Resistance was successful only when the powers of states were called into action. In France the Papal abuses led to the Pragmatic Sanction (1438); in England they were met by the Statutes of Provisors (1350–1415), by which all persons who should attempt to enforce the authority of Papal provisions in England are subjected to severe penalties. In Roman Catholic countries the law of patronage is founded on the principles adopted by the third and fourth Lateran Councils. By the canon law a lay patron must exercise his right of presentation within four months, the time being extended to six when the patron is an ecclesiastic; if not exercised within that time the right accrues to the bishop of the diocese. In England the sovereign is the patron paramount of all benefices which do not belong to other patrons. All persons seized in fee, in tail, or for life, or possessed for a term of years of a manor to which an advowson is appendant or of an advowson in gross, may present; and this right descends by course of inheritance from heir to heir or passes to a devisee or purchaser unless the benefice become vacant in the lifetime of the patron, when the void turn devolves upon the personal representatives. The following persons cannot present:—A lunatic (the lord-chancellor then presents), an outlaw during the outlawry, municipal corporations, an alien (the crown in this case having the right), a Papist (the right devolving on the Universities of Oxford and Cambridge).

In Scotland the statute which abolished Popery and recognized the reformed religion reserved the right of presentation to the just and ancient patrons (1567); and subsequent acts provided that the presbyteries be bound to admit any qualified minister presented by the sovereign or lay patrons; and that if a presbytery refused the minister presented the patron was entitled to retain the fruits of the benefice. On the establishment of Episcopacy the principle of these acts was adopted in the act of 1612, cap. i., by which presentations were appointed to be directed to the bishop. Some time after the re-establishment of Presbytery patronage was abolished by act 1649, cap. xxiii., which empowered presbyteries to settle ministers on the suit and calling, or with the consent of the congregation, on whom none was to be intruded against their will. At the restoration patronage was replaced on its former footing by the Rescissory Act. By the act 1690, cap. xxiii. patronage was again abolished and the right to present transferred to the Protestant heritors and elders of the parish, subject to the approval or disapproval of the whole congregation. Patrons were to receive a compensation of 600 merks (£33, 6*s.*), on payment of which they had to formally renounce their rights. Only three parishes had obtained effectual renunciations when the right of patrons to present was again restored by 10 Anne, cap. xii. This act, with modifications introduced by 6 and 7 Vict. cap. lxi. (Lord

Aberdeen's Act), was law up till 1874. The first step in the settlement of a parish minister was the presentation by the patron; but the presentee, before he had a right to the emoluments of the benefice, had to be admitted to it by the presbytery. He was first appointed to preach certain trial sermons. By Lord Aberdeen's act it was provided that after the trial sermons the presbytery should give to the members of the congregation opportunity to state any important objections to the presentee. The presbytery were to dispose of these objections or refer them to a superior church court; and if the objections were considered well founded the presentee could be rejected by the presbytery. By the Patronage Act of 1874, 37 and 38 Vict. cap. lxxxii. patronage was again abolished, and the right of choosing their own minister devolved upon the congregation, the former patron to receive as compensation a sum equal to one year's stipend, or a proportion thereof if he is a joint patron. In the Protestant churches of Denmark, Germany, and Sweden patronage exists to some extent, subject to more or less restriction in different localities. In the Greek Church it is in the hands of the bishops, except in Russia, where lay patronage is exercised to a certain extent.

PATRONYMIC (Greek, *pater*, father, and *onoma*, name), a name which designates a person in reference to some of his ancestors, either immediate or remote. In Sanskrit, Greek, and Latin patronymics are very common. In Sanskrit they have thirteen recognized terminations. In Greek the suffixes were *idēs, iōn, iadēs, eides*, &c. for the masculine, and *ias, is, as*, &c. for the feminine. Achilles is called by Homer both Pelides and Æacides, Peleus being his father's name and Æacus that of his grandfather. The Latins borrowed their patronymic terminations *ides* and *is* from the Greek. Among modern languages the Russian, Danish, German, and English have adopted patronymic terminations, the suffixes being respectively *vitch, sen, sohn* or *son*, and *son*. The Norman *Fitz*, the Welsh *Ap*, the Irish *O*, and the Highland *Mac* are prefixed to the paternal name, which thus becomes a patronymic. See NAMES (PERSONAL).

PAU, a town of France, capital of the department of Basses-Pyrénées, on a lofty ridge on the right bank of the Gave-de-Pau, here crossed by a fine bridge, 58 miles E.S.E. of Bayonne, and commanding a magnificent view of the Western Pyrenees. It has several squares, of which the Place Royale, with a finely planted promenade, and a marble statue of Henry IV., and the Place-de-la-Comédie, communicating with a suburb by a bridge which spans a deep ravine, are the most deserving of notice. The most conspicuous and interesting edifice is the castle in which Henry IV. was born, crowning a lofty peak at the western extremity of the town, and overhanging the Gave. It is a huge, angular, and irregular structure, flanked with towers, of which five still remain, the highest (the Tour de Gaston-Phœbus) or donjon having a height of 100 feet, and another, called the Tour de la Monnaie, being the traditional asylum which Margaret of Valois gave to Calvin and other persecuted reformers. Great part of the castle was restored in good taste, and provided with antique furniture acquired at great expense by Louis-Philippe. Pau has a court of appeal for the departments of Basses-Pyrénées, Hautes-Pyrénées, and Landes; courts of first resort and commerce; an academy, college, museum, library, agricultural society, and society of science, literature, and art. The manufactures consist of napkins, excellent table linen, rugs, carpets, paper, and leather. The trade is in wine, Bayonne hams, salt provisions, excellent chestnuts, printed cottons, iron, &c. Pau has given birth to two sovereigns, Henry IV. and Bernadotte (Charles XIV. of Sweden). It is a favourite resort of the English in winter, having a mild, dry climate, with no sudden variations of temperature; it is a convenient starting-place for travellers desirous of exploring the Pyrenees. Pop. (1881), 29,971.

PAUL, the apostle of the Gentiles, was born of Jewish parents, at Tarsus, in Cilicia, and inherited the rights of a Roman citizen. His original name was Saul. He received a learned education, and early went to Jerusalem to study under Gamaliel, one of the most celebrated Jewish rabbins in the time of our Saviour, who instructed him in the Jewish laws and traditions. He was also acquainted with the Greek poets and philosophers, as his epistles show, and learned a trade (that of a maker of tents), according to the custom of the Jewish teachers, by which he afterwards supported himself in his travels. Thus prepared for the office of teacher, he joined, a few years after the death of Jesus, the sect of the Pharisees, and became a persecutor of the Christians, to crush whom the Sanhedrim employed him both in and out of Jerusalem. The Acts of the Apostles contains several instances of the heat of his zeal in this cruel work, upon which he entered from his attachment to the law of his fathers. He was present at and encouraged the stoning of Stephen to death. He was even on his way to Damascus, with full power from the chief priests to arrest the Christians, when he was led by a miracle (Acts ix. and xxii.) to view Christianity in a different light, and to seek a personal knowledge of the excellence of the religion from the instructions of Christian teachers. The disciples had at first strong suspicions against their late persecutor, but they were allayed by Barnabas. His former coreligionists on various occasions tried to compass his death. His sudden conversion, effected by the divine interposition, was indicated by the change of his name from *Saul* to *Paul*, and he engaged in the work of an apostle with an ardour that overcame every difficulty. Arabia, Syria, Asia Minor, Greece, and the islands of the Mediterranean were the scenes of his unwearied activity in promulgating the doctrines of Christianity. In all his journeys he laboured to establish new churches and to confirm the faith of those already existing. He made himself useful to the churches of Antioch (where he first preached the gospel to the Gentiles), Ephesus, and Jerusalem by instructing them, by arranging their ceremonies, and collecting alms for the poorer members. The churches of Philippi in Macedonia, of Corinth, Galatia, and Thessalonica honoured him as their founder; and the Epistles in the New Testament, which he wrote to these churches, and to the churches in the chief cities of Greece and Asia Minor, and to Rome, show the paternal relation in which he stood to them and the paternal care which he exercised over them. By admitting the Gentiles to a participation in the blessings of Christianity, without requiring them to submit to the Jewish rites, he promoted the progress of Christianity far more than he could have done had he baptized none but his own countrymen. But this conduct exposed him to the hatred of the Jews, who persecuted him as an apostate; and everything at Jerusalem was prepared for his destruction. In the sixtieth year of the Christian era, after labouring with unwearied zeal for more than twenty years to spread the doctrines of Jesus, he boldly went to Jerusalem with the money which he had collected for the support of the oppressed Christians in Palestine. He was there arrested and brought to Cæsarea, where he was kept a prisoner for two years by the Roman governors Festus and Felix. The fearless spirit with which he explained his whole conduct excited the same admiration which had been produced in the Areopagus and among the

wise men of Athens (where Dionysius the Areopagite became one of his adherents) by his enthusiastic eloquence. Having been illegally imprisoned he appealed, as a Roman citizen, to the emperor, and was sent to Rome. He was shipwrecked at Melita (Malta), and in the spring of the year 62 arrived at the capital of the world. He was treated with respect, but as a prisoner of state, and gained over many distinguished Romans to the Christian faith. It is certain that he was set free in the year 64; but the account of his farther travels in Spain, Britain, Macedonia, Greece, and the borders of Asia is founded solely on conjecture. In the year 66 Paul returned to Rome, was again arrested, and, according to the early church historians, died the death of a martyr. The history of no apostle is so rich in remarkable events, hardships, and sufferings as that of this great man. Even the enemies of the religion for which he lived and died could not deny the gifts of his mind, his deep and extensive knowledge, profound understanding of the nature of religion, richness and acuteness of thought, and high talent for teaching.

PAUL, the name of five popes.—PAUL I., pope from 757–767, brother of Stephen II., stood on good terms with Pepin and Charlemagne. A council held under him at Gentilly maintained the procession of the Holy Spirit from the Son, in opposition to the Greek Church. Letters written by him are still extant, and he has found a place in the calendar.—PAUL II., pope from 1464–71, a native of Venice, originally called Pietro Barbo, archdeacon of Bologna and bishop of Cervia, then apostolical protonotary and cardinal, a nephew of the notorious Eugenius IV., was ostentatious and dissipated in his habits. Shortly after the commencement of his pontificate he annulled the electoral law, which not long before had been arranged with the emperor. He excommunicated George Podiebrad, caused a crusade to be preached against him, and was continually engaged in dealings with King Ferdinand of Naples. In France, owing to the firmness of the parliament, he could not succeed in obtaining a formal repeal of the pragmatic sanction.—PAUL III., pope from 1534–49, formerly Alessandro Farnese, a Roman by birth, bishop of Ostia and dean of the college of cardinals, established the order of Jesuits, opened the Council of Trent, defended himself by his legates in the conferences between Catholics and Protestants at the Diets of Worms and Ratisbon; established, on the suggestion of Cardinal Caraffa, a general inquisition for the suppression of Protestantism, and thereupon began a reckless crusade against the Reformation.—PAUL IV., pope from 1555–59, formerly John Peter Caraffa, a Neapolitan, bishop of Chieti, protested, along with Cajetan, founder of the order of Theatines, against the religious Peace of Augsburg, and the conferring of the imperial crown on Ferdinand I. He energetically directed the power of the Inquisition against everything tending to favour Protestantism, established an Index Librorum Prohibitorum, caused a vigilant search to be made after heretical books for the purpose of burning them, and, not satisfied with combating the advancing opinions of the age, sought to re-establish the ancient supremacy of the Papal see. His violent proceedings were so detested by the people and a great part of the nobility of Rome, that a violent tumult broke out after his death, and almost every memorial of him was destroyed.—PAUL V., pope from 1605–21, formerly Camillo Borghese, a rigid canonist, in a struggle with the Venetian Republic, which held the views of Paul Sarpi, was obliged to succumb, though he was vigorously supported by the Jesuits, and especially by Bellarmin. The chief controversies of his time related to grace and the immaculate conception.

PAUL I., Emperor of Russia, son of Peter III. and Catharine II., was born in 1754. His father, on account of his dislike of Catharine, would not acknowledge his legitimacy; but on the death of Ivan in 1763 he became the sole remaining heir to the crown, and was placed under the care of Count Panin and Æpinus. His mother treated him with great rigour, and kept him constantly estranged from public affairs during her life. In 1773 he married a Princess of Hesse-Darmstadt, who died soon after, and in 1776 he married Princess Dorothea of Würtemberg, who became the mother of the Emperor Alexander I., Prince Constantine, the late Emperor Nicholas, and the Grand-prince Michael, and several daughters. In 1780 he travelled, with his wife, under the title of Count of the North, in Poland, Germany, Italy, France, and Holland, and after his return retired to his usual place of residence, the Palace of Gatschina, and was permitted to take part neither in civil nor military affairs. On the death of Catharine in 1796 the prince was finally released from his long restraint; and the first acts of his government, after performing the obsequies of his mother, and paying the last honours to his father, whose murderers he disgraced, were dictated by benevolent intentions. He put an end to the war with Persia, and liberated the Poles who were in confinement in Russia. But the severe treatment to which he had been subjected for forty years had exercised a most injurious influence upon his character, and, combined with the natural violence and impetuosity of his temper, led to those acts of despotism and folly which stain his reign. He joined the coalition of crowns against France, and sent 100,000 men, partly under Suwaroff and Korsakoff, to Italy and Switzerland, and partly to Holland. The Russian arms were at first successful; but after the defeat at Zürich his increasing distrust of the British and Austrian courts, and the artful management of General Bonaparte, who dismissed the Russian prisoners newly clothed and armed, and insinuated new suspicions into the mind of the czar, broke off his connection with the coalition. Louis XVIII., who had been received into the Russian territory with every mark of attention, and the French emigrants were ordered to quit the country. Paul had caused himself to be declared Grand-master of the Knights of Malta (1798), after the resignation of that dignity by the Baron Hompesch; but Britain, having conquered the island in 1800, refused to surrender it to the Russian emperor. Paul therefore laid an embargo on all British ships in the Russian ports, and prevailed upon the Swedish, Danish, and Prussian courts to enter into a convention for the protection of their commerce against the encroachments of the British by sea. His internal administration was characterized by similar traits of impetuosity, and in many cases of tyranny. His innovations in the army (particularly the introduction of hair-powder and queues); his prohibition against the wearing of round hats, pantaloons, &c.; his order obliging all persons who met him in the streets to leave their carriage, and prostrate themselves before him; and other acts of a similar nature, excited general discontent. Other measures of a more serious character finally produced a conspiracy among the nobles. They excited mutual suspicions between Paul and his sons, and Alexander finally consented to assume the government until the mind and health of his father were restored. The conspirators entered the antechamber of the emperor, in St. Michael's Palace, at 11 o'clock at night (March 24, 1801), by a secret passage, and the door to the emperor's chamber was opened by the guard, who was deceived by an alarm of fire. An act was then read to him, by which he was to acknowledge himself incapable of conducting the government, and

surrender it to Alexander. Paul cried out, 'I am emperor, and will remain so;' and he was then despatched by the conspirators. Some accounts say that he was strangled in his bed with his own sash. In the Russian manifesto on the subject his death was ascribed to apoplexy.

PAUL, St. Vincent de, one of the most eminent of modern philanthropists, was born of poor parents, in the village of Pouay, in the diocese of Dax, in the year 1576. Some of his early years were spent on the slopes of the Pyrenees tending his father's scanty flock; but as the boy exhibited signs of remarkable promise, he was sent to be educated first at Dax, and then at Toulouse. There he completed his ecclesiastical studies, and was ordained priest in 1600. In 1605, while on a voyage from Marseille to Narbonne, he was captured by Turkish pirates, and sent to Tunis, where he was in slavery for two years under three different masters, the last of whom, a renegade from Nice, he reconverted to Christianity, and induced to escape with him to France. They reached Aigues-Mortes in a little skiff, 28th June, 1607. The next year Vincent spent in Rome, where he secured the friendship of Cardinal d'Ossat, who sent him to Paris on a secret mission to Henry IV., and who afterwards procured his nomination to the Abbey of St. Leonard de Chaume, in the diocese of Rochelle. About the same time he was appointed almoner to Queen Margaret of Valois. In 1613 Philippe Emanuel de Gondi, count de Joigny, confided to him the education of his sons, one of whom became afterwards famous as the Cardinal de Retz. In 1616 he began the course of labours as a missionary which occupied so large a portion of his life, and the next year he laid the foundation of the institution which eventually developed into the influential congregation of Priests of the Mission, an association of priests who devote themselves to the task of assisting the parish clergy, by preaching and receiving confessions periodically in those districts to which they may be invited. The associates received royal letters patent in 1627, were erected into a congregation by Pope Urban VIII. in 1632, and in the following year established themselves in the Priory of St. Lazare in Paris, whence the name of Lazarists, by which they are sometimes called. The reformation of the hospitals, the establishment of the first foundling hospital in France, the institution of the Sisterhood of Charity, the instruction of idiots at his Priory of St. Lazare, and continual labours among the convicts sent to the galleys are the next events to be recorded in his history. It is said that he wore for some weeks the chains of a convict more unfortunate than guilty, but the story has been questioned. During the famine which depopulated Lorraine (1638–39) he collected and distributed 2,000,000 livres among the sufferers. He attended Louis XIII. in his last illness, and was appointed by the queen-regent one of the four members of the Conseil de Conscience, to whom was committed the charge of distributing ecclesiastical preferments. During the wars of the Fronde the Priory of St. Lazare was sacked by the mob, Vincent being wrongfully supposed to have favoured Mazarin. Among the last acts of his life was the foundation of an asylum for aged working people of both sexes, and a hospital for all the poor of Paris, which was opened in 1657. He died in Paris, 27th September, 1660, and was canonized by Clement XII. in 1737. His preaching was more remarkable for its simple impressiveness than a show of learning. During his lifetime he published only the Regulæ seu Constitutiones communes Congregationis Missionis, and in 1826 appeared Conférences spirituelles pour l'explication des Règles des Sœurs de la Charité. He left behind him a pretty voluminous correspondence on spiritual subjects, chiefly addressed to the Priests of the Mission and other friends.

PAULA, Francis de. See Francis of Paula.

PAULDING, James Kirke, an American author, was born in Pleasant Valley, Dutchess county, New York, 22d August, 1779. His education was acquired partly at a village school, and partly by a course of self-instruction. About the beginning of the present century he removed to New York, where he became intimately acquainted with Washington Irving, and published in connection with him a series of humorous and satirical essays, entitled Salmagundi. Gratified with the success of this work Paulding determined to devote himself to literature, and during the war between the United States and Britain in 1812 he published an allegorical satire, called The Diverting History of John Bull and Brother Jonathan. In 1813 appeared his Lay of the Scottish Fiddle, a burlesque of Scott's Lay of the Last Minstrel. It was followed by a pamphlet on the United States and England, defending American institutions from the attacks of the Quarterly Review. This brought him under the notice of President Madison, who appointed him secretary to the Board of Naval Commissioners. A visit to Virginia gave him the materials for his next work, Letters from the South by a Northern Man (1817); and the following year he published his longest and best poem, The Backwoodsman. His succeeding works of importance are a second series of Salmagundi, entirely his own composition (1819); A Sketch of Old England by a New England Man (1822); John Bull in America, or The New Munchausen (1824); his first novel, Konigsmarke (1823); Merry Tales of the Wise Men of Gotham (1826); The Travellers' Guide (1828), called in subsequent editions The New Pilgrim's Progress, owing to the curious mistake of its having been considered a *bona fide* guide book; The Dutchman's Fireside (1831), a story of the old French war, the finest of his novels; Westward Ho! (1832), another successful novel; A Life of Washington (1835); Slavery in the United States (1836), in which he defends the planters' view of that institution. Having held for some years the lucrative post of navy agent for the port of New York, he was appointed in 1837 by President Van Buren secretary of the navy. In 1841 he retired to his country seat at Hyde Park, where he spent the remainder of his life. Here he produced two novels, The Old Continental (1846), and The Puritan and his Daughter (1849); together with a collection of stories, entitled A Gift from Fairyland, and in connection with his son, William Irving Paulding, a volume of American Comedies (1847). His death took place 6th April, 1860.

PAULICIANS. In the chains of the Caucasus and Taurus, which unite in Armenia, a few of the ancient Manichæans and Gnostics were remaining in the eighth century, who assumed the name of *Paulicians*, from Paul their leader, to save themselves from the persecutions to which the Manichæans were always exposed. As iconoclasts they were favoured or persecuted by the Greek emperors according as the latter were favourable or otherwise to the worship of images, which the Manichæans totally rejected. When their Manichæism was discovered in the ninth century they were subjected to violent persecution. Many of them were put to death; others fled to Mohammedan countries, and assisted them in their wars against the Greeks. In the tenth century the attempts at the conversion of some Paulicians who returned, and were fixed in Thrace by John Zimisces, the Greek emperor, were as unsuccessful as the persecutions had been. When the Crusades had opened a way to the middle of Europe, different companies of

this sect passed as pilgrims from the Holy Land up the Danube, and entered Italy with the Levant trade through Venice. The Vaudois and Albigeois sects (Waldenses and Albigenses) are said to have sprung from this stock. Such is the account given of them by Photius and Petrus Siculus, but a different view has been taken by modern ecclesiastical historians, as Neander, Gieseler, and others. According to these writers the sect was founded by one Constantine of Mananalis (near Samosata), who, having received a present of two volumes, one containing the Gospels and the other the epistles of St. Paul, conceived so great a veneration for the apostle of the Gentiles that he assumed his name; and so well did he communicate this feeling to his followers, that they adopted the names of the revered apostle's friends, such as Timothy, Tychicus, &c. They rejected the adoration of the Virgin and the saints, and refused homage to the cross; they denied the validity of the sacraments, interpreting spiritually baptism and the Lord's supper; would not recognize any priestly dignity; and their public worship was altogether free from ritual. They had nothing in common with Manichæan fatalism, and the charge of having founded their doctrines upon Manichæism was falsely brought against them by their enemies. A remnant of this sect is said by a modern Greek historian to have existed at Philippopolis about the beginning of the present century.

PAUL OF VENICE, a celebrated ecclesiastic and historian of the sixteenth century, whose proper name was Pietro Sarpi, was born at Venice, Aug. 14, 1552, and was the son of a merchant of that city. He entered young into the religious order of the Servites, and in his twentieth year was appointed chaplain to the Grand-duke of Mantua, and lecturer on the canon law. After two years he returned to Venice, and became provincial of his order. He was afterwards made Procurator-general of the Servites. A treacherous correspondent having betrayed a letter of Father Paul, in which he had observed that so far from coveting the dignities of the court of Rome he held them in abomination, brought on him the imputation of being a heretic, while his liberal intercourse with eminent Protestants contributed to increase the prejudices thus excited. In a dispute between the pope and the Venetian government on the subject of ecclesiastical immunities Father Paul showed himself a strenuous advocate for the cause of liberty, and was summoned to Rome, on pain of excommunication, to answer for his conduct; but the affair was compromised. To the vengeance of his political enemies may be attributed an attempt to assassinate him in 1607, on which occasion he received many dangerous wounds from a band of ruffians. Father Paul employed the latter part of his life in writing the history of the Council of Trent, in which he has developed the intrigues connected with the transactions of that famous assembly, with a degree of boldness and veracity which renders the work one of the most interesting and important productions of the class to which it belongs. The labours of Father Paul extended to various branches of knowledge; he was deeply skilled in the canon law, and distinguished for his acquaintance with anatomy. He appears to have discovered the valves of the veins which contribute to facilitate the circulation of the blood. He died January 14, 1622, and is said to have expired after uttering the words *Esto perpetua*, which have been construed as a prayer for the prosperity of Venice. The history of the Council of Trent was first published in London in 1619, having been transmitted to this country through the medium of the British resident at Venice, Sir Henry Wotton, a personal friend of the author. This work is strongly anti-papal, nay, even rationalistic in tone, and was answered by a voluminous work on the same subject by the Jesuit Pallavicino. The works of Father Paul were printed at Verona, 1761 (eight vols. 4to), and at Naples, 1790 (twenty-four vols. 8vo).

PAUL'S (ST.) CATHEDRAL, London, the largest Protestant church in the world, is situated on Ludgate Hill, an elevation on the north bank of the Thames. The site of the present building was originally occupied by a church erected by Ethelbert, king of Kent, in 610. This was destroyed by fire in 1087, and another edifice, Old St. Paul's, was shortly afterwards commenced. The structure was in the Gothic style, in the form of a Latin cross, 690 feet long, 130 feet broad, with a spire rising to the height of 520 feet. Near the north-east end stood Powle's Cross, often alluded to in our early literature, and a pulpit where sermons were preached and Papal mandates read aloud to the people. The middle aisle was termed Paul's Walk, from its being frequented by idlers as well as money-lenders and general dealers. A carpenter and a wine merchant took possession of part of the vaults, trunk-makers of the cloisters; buildings were planted against the outer walls, one being used as a theatre, and in another the occupant made a hole in a buttress, in which he baked his bread. Old St. Paul's was much damaged by a fire in 1137, by lightning in 1444, again by fire in 1561, and was utterly destroyed by the great fire in 1666. The ruins remained pretty much as they had been left by the fire for about eight years, when the rebuilding was taken in hand by the government of Charles II. The first stone was laid June 21, 1675. In ten years the walls of the choir and of the side aisles were completed, together with the circular porticoes on the north and south sides. The last and highest stone of the building was placed upon the summit of the lantern in 1710, and soon after the queen and the two houses of Parliament attended service in the church. The whole building was completed at a cost of £747,954 in thirty-five successive years, under one architect (Sir Christopher Wren), one master-mason (Thomas Strong), and one Bishop of London (Dr. Henry Compton). The building is of Portland stone, in the form of a Latin cross. Its length is 500 feet; the width of the nave and choir, 125 feet; the length of the transept, 250 feet; the general height is 100 feet. Two rows of massy pillars divide the interior into a nave and side aisles. The west front towards Ludgate Street is very noble. The elevated portico forming the grand entrance consists of twelve Corinthian columns, with an upper portico of eight pillars of the composite order, supporting a triangular pediment. The entablature represents in relief the conversion of St. Paul, a work of Francis Bird. Two turrets adorn the north-western and south-western angles of the cathedral. Upon the south front, which corresponds with the north, is a phœnix rising from the flames, with the motto, 'Resurgam' (I shall rise again). The dome is one of the most remarkable points of sight in the view of London, and is one of the noblest structures of the kind in the world. It is surmounted by a lantern carrying a gilt copper ball and cross, the top of which is 356 feet above the floor of the church. But the interior decoration of this building does not correspond with its exterior magnificence. The pavement is composed of slabs of black and white marble joined in the manner of a large chess-board, increasing thereby the feeling of vacancy which vast walls left utterly devoid of ornament naturally excite. The most favourable view of the interior is from the whispering gallery, in the lower part of the dome. Sir James Thornhill's paintings, illustrative of the most remarkable occurrences in the life of Paul, can be seen to most advantage from this situation. The

great bell is tolled only on the death of some member of the royal family, of the lord-mayor, of the Bishop of London, and of the dean of the cathedral. You reach the ball by 616 steps. To break the uniformity of the interior it was suggested in 1790 to erect in the interior monuments and statues to the illustrious dead. The first was in memory of John Howard (1796). The monument of Nelson, who is buried in a tomb in the middle of the building, is the work of Flaxman. There are monuments also to Earl Howe and Sir Joshua Reynolds by the same sculptor; statues of Generals Bowes and Gillespie and of Bishop Heber, by Chantrey; and monuments to Lord Rodney, Lord Heathfield, Admiral Collingwood, General Abercrombie, Duke of Wellington, &c., by Rossi, Westmacott, and others. Over the entrance to the choir is a marble slab with this inscription in Latin, 'Here reposes Christopher Wren, the builder of this church and city, who lived for more than ninety years, not for his own but for the public good. Reader, dost thou seek his monument? Look around thee.' It has been in contemplation for some time past to execute considerable alterations and adornments on the exterior and in the interior of the cathedral, and a large sum of money has been collected for this purpose; but the plans hitherto exhibited have failed in giving universal satisfaction, on account of their reputed tawdriness, inefficiency, and unnecessary expense.

PAULUS ÆGINETA, a celebrated Greek medical writer, was born in the Island of Ægina; the date of his birth has been variously stated, some putting it as early as the fourth, and others as late as the beginning of the seventh century. From his own writings we learn that he was connected with the medical school of Alexandria, but whether as teacher or student we know not. He appears to have travelled in Greece and other countries, but little more is known of his life. Although he can hardly be classed among the greatest original medical writers, he is not to be considered a mere copyist. He abridged the works of Galen, and was deeply read in those of Hippocrates, Ætius, and Oribasius, but always submitted their conclusions to the test of his own experience. His works, the most important of which is generally known as De Re Medica Libri Septem, have been frequently published; the first Greek text appeared at Venice in 1528, a good Latin edition at Paris in 1532, and an English translation by Francis Adams (London, 1844–47, three vols. 8vo).

PAULUS DIACONUS (that is, 'Paul the Deacon'), also called WARNIFRIDUS, and PAULUS MONACHUS (Paul the Monk), was born of a noble family at Friuli about 730, and was educated in the court of the Lombard kings at Pavia. On the capture of Desiderius, the last king of the Lombards, by Charlemagne, he retired to the monastery of Monte-Casino, where he took the habit. In 781 he was called to the court of Charlemagne, and was one of the principal instruments of the intellectual reforms effected by the emperor in the countries of Western Europe. Paulus drew up a book of homilies from the fathers, which was in general use throughout Europe during the middle ages. He also wrote a history of the bishops of Metz—Gesta Episcoporum Mettensium—which is to be found in the second volume of Pertz's Monumenta Germaniæ Historica. In 787 he returned to his monastery at Monte-Casino, and spent the rest of his life in religious and literary labours. Here he wrote his history of the Lombards (De Gestis Longobardorum Libri VI.), his principal work. It is written in a lucid and elegant style, and is prized for its general truthfulness; it contains a mass of information elsewhere unattainable. It commences with the migration of the Lombards from Scandinavia to the death of King Liutprand. The best edition is contained in Muratori's Rerum Italicarum Scriptores.

PAUL VERONESE. See CAGLIARI.

PAUSANIAS, a Lacedæmonian general, son of Cleombrotus, regent of Sparta, and nephew of Leonidas. He was appointed guardian of his cousin Plistarchus, the son of Leonidas, during his minority, and in this capacity he commanded the allied Greeks at the battle of Platæa. To himself alone he ascribed the victory, and on the golden tripod offered by the Greeks in the Temple of Apollo at Delphi he placed an inscription, which the Lacedæmonians subsequently replaced by the names of the allied states, representing himself as the sole conqueror. He became still more insupportable after having, at the head of the allied Greek fleet, delivered the Grecian cities, and after a long struggle Cyprus also, and finally Byzantium itself, the key of Asia Minor, from the Persian yoke. At length he entered into secret negotiations with Xerxes, and conceived the design of making himself master of Greece. He even adopted Persian habits and costume, and carried things so far that the disgust of the allies could no longer be suppressed, and they offered to Athens the superiority which had hitherto been recognized in Sparta. The Spartans summoned him home; but hardly was he acquitted in consideration of his rank and services when he betook himself again to Byzantium, under the pretence of taking part in the campaign. Being compelled by the Athenians to leave the city, he went to Colonæ in Troas, and entered into fresh negotiations with the enemies of Greece. He was once more recalled and imprisoned; but notwithstanding the charges against him, was again liberated under promise to appear whenever he should be summoned. But he entered into new negotiations with the Persian king. The ephori now determined to punish him according to the rigour of the law. Pausanias having been informed of the fate which awaited him, took refuge at the feet of Athena Chalciœcus. But his indignant mother, it is said, brought the first stone to close the entrance of the temple. The people followed her example, and the unhappy prisoner, being thus walled up, died of hunger. He was buried before the temple, and the anger of the goddess at the violation of her temple was appeased by the erection of two bronze statues. His death took place between B.C. 471 and 466.

PAUSANIAS, a Greek topographical writer who flourished during the reigns of the Antonines. Nothing is known of him but from his writings. His Hellados Periēgēsis is an itinerary of his travels, which were extensive. It is in ten books, the eighth of which appears to have been written about 174. He appears to have visited all the most important places in Greece. He describes Attica, Megaris, Corinthia, Sicyonia, Laconica, Messenia, Achæa, Bœotia, &c. He appears also to have visited Rome, Syria, and Palestine. Pausanias is supposed to have been a native of Lydia. His style is said to be Asiatic, and it is not that of the best Greek writers. His account of Greece describes temples, theatres, tombs, statues, pictures, monuments of every sort. It is a valuable work for the antiquarian and historian. He also mentions mountains, rivers, and fountains, and the mythological stories connected with them. He appears to have been a profound believer in mythology, and relates the various legends belonging to it in all good faith. His observation is accurate, and his descriptions simple and practical, so that the fullest confidence may be put in him where he speaks as an eye-witness. His work has been edited by Kühn (Leipzig, 1696, folio), Facius (Leipzig, 1794–97,

4to), Sibelis (Leipzig, 1822, four vols.); the latest edition is that of Dindorf (Paris, 1845). The French translation by Clavier and others (Paris, 1814–23) contains the Greek text and notes in six vols. We have an English translation by Taylor.

PAUSILIPPO, a hill near Naples, with a large and beautiful grotto (*la grotta di Pausilippo*). This is a straight passage cut through the rock from Naples to Puzzuoli; the height, about 70 feet at the entrance, is unequal; breadth, 21 feet; length, 2244 feet. Through this grotto formerly passed the daily travel of a very populous district. It is so situated that the rays of the setting sun penetrate it in February and October from one end to the other. Strabo assigns the work to Cocceius, and as a person of this name was superintendent of aqueducts under Tiberius, this would give it a comparatively late origin, its existence being frequently held to be altogether anterior to the time of the Romans. It was subsequently made broader and higher, paved, and provided with two air-holes. The whole rock is firm, and has never been shaken by earthquakes. In the centre there is a chapel of the Virgin Mary; over the grotto are the remains of an aqueduct and of what is called Virgil's Tomb. In the year 1822 the Austrian troops constructed a road over the Pausilippo to Puzzuoli, by which the passage through the grotto is avoided. In the course of this work a grotto was found at the summit of the Pausilippo, which is probably the *crypta Pausilypona* of the ancients, the name which is now given to what Seneca called the *crypta Neapolitana*.

PAVEMENT. The general use of pavement for streets is comparatively recent. No large European city, Rome only excepted, had paved streets till towards the twelfth or thirteenth century. More mention is made in the ancient authors of paved highways than streets, which Beckmann, in his History of Inventions, ascribes, however, to the simple circumstance that the latter were probably paved by the citizens, each taking the part before his own house, so that the government was not required to make provision for this purpose. Isidore says that the Carthaginians were the first people who had paved streets, which were soon imitated by the Romans; but long before that time Semiramis paved highways, as her own vainglorious inscription, preserved by Strabo, asserts. At Thebes in Bœotia the streets were under the care of telearchs, who provided for repairing and cleaning them. Epaminondas's being appointed to the office rendered it honourable and sought for, whilst before it had been contemned, and for that very reason given to that great general. Jerusalem seems not to have been paved in the times of Agrippa, according to Josephus. When Rome was first paved is not exactly ascertained, though many antiquarians consider it to have been in the year of the city 578, according to a passage of Livy, which admits, however, of several explanations. The ædiles at first had the superintendence of the streets, at a later period particular officers called *curatores viarum*. Pavements of lava, with elevated side-walks, are found at Herculaneum and Pompeii. Of modern cities Paris is generally mentioned as having the oldest pavement; but it is certain that Cordova in Spain was paved about 850 A.D. by Abderrahman II., who also brought water to the city in leaden pipes. Paris was not paved in the twelfth century, for Rigord, physician and historian of Philip II., tells us that the king, standing at his window, and disgusted with the dust and dirt thrown up by the vehicles, resolved to pave the street, for which orders were issued in 1184; and this is confirmed by several historians. It is certain that many streets of Paris were not paved even in 1641. All historians allow that London was not paved at the end of the eleventh century. It is not certain when it was first paved; probably the paving took place by degrees. Holborn was first paved in 1417, the great Smithfield Market not until 1614.

Street pavements of stone in modern cities are laid upon a uniform principle. Unless the natural foundation is sufficiently solid a bed of concrete is laid, sloping to the sides, to allow the water to run off. Upon this is placed the pavement, which consists of blocks of granite, trap, or other stone of hard and solid texture, of 1 or 2 feet in length, 6 or 7 inches in breadth, and 10 or 12 in depth. The interstices are filled with sand and grouted with lime. Cementing with mortar is not commonly used, although it would render the pavement more durable, on account of the frequency with which the pavement in towns has to be lifted. Arbroath and Caithness supply the best paving-stones. Asphalt pavements are frequently used for side-walks, and have also been introduced for street pavements. They are comparatively noiseless, but are somewhat dangerous for horses, being remarkably slippery in wet weather. They are also liable to become soft in hot weather. Concrete pavement is composed of broken stone, &c., mixed with tar or asphalt. Liquid iron asphalt (Barnett's) is pulverized iron-ore mixed with asphalt and mineral tar. It is laid on over concrete to a thickness of 2 inches. Improved wood-pavements have recently been introduced experimentally in London and other cities. They lay claim to great advantages, as noiselessness, elasticity, durability, uniformity of surface, with freedom from slipperiness; but time has not yet been afforded for testing them thoroughly. They are laid on a bed of sand of sufficient depth to afford a good grade, say from 1 to 2 inches; on this is laid a flooring of two thicknesses in parallel lines, the upper layer of boards transversely to the lower. Upon these are laid the blocks which form the pavement, and the size of which is $9 \times 3 \times 5$ inches. The blocks are placed on their ends, so that the cross surface of the wood is exposed. To steady the blocks during construction a strip of wood $1 \times \frac{3}{4}$ inch is laid between each row of them, and nailed to the flooring. The spaces between the blocks are then filled with hot gravel, upon which hot tar or pitch is poured, and the whole rammed home tight. This process is repeated until the spaces are filled to the level of the wood; the surface is then spread over with tar, and covered with a layer of fine gravel.

PAVIA (anciently *Ticinum*), a city of Italy, in Lombardy, 19 miles S.S.W. of Milan, capital of a province of the same name, beautifully situated on the left bank of the Ticino, which is here crossed by a bridge of eight arches, and about 2 miles below the town falls into the Po. The bridge, of stone and brick, is covered with a curious roof supported by 100 granite pillars. Pavia is surrounded by ancient walls, which have a circuit of about 3 miles, inclosing a far larger space than its present inhabitants require, and giving it, in connection with numerous palaces, either ruinous or untenanted, a deserted and melancholy look. It consists of a principal street, called the Strada Nuova, or Corso, which traverses it centrally, contains its most important edifices, and constitutes its great thoroughfare; and of a great number of minor streets, placed at right angles to the Corso, and occasionally opening into squares. Of the ecclesiastical edifices the most important are the cathedral, a large, heavy, unfinished structure, crowned with a lofty dome, remarkable chiefly for the air of gloom thrown around it, giving its interior the appearance of a vast cavern above ground, but containing some good paintings, and a beautiful side chapel, with the tomb of St. Augustine; San Michele, a

heavy marble edifice, apparently of Lombard origin, and supposed to belong to the sixth or seventh century; Santa Maria del Carmine, an enormous Gothic church of imposing exterior, built in 1373, and possessed of good pictures; Incoronata, or Santa Maria de Canepanova, in the *cinque-cento* style, by Bramante; and San Francesco, built of the finest brick-work, and presenting a beautiful specimen of pure Italian Gothic. The only other edifices particularly deserving of notice are the Castello, erected by Galeazzo Visconti, 1460–69, on the site of the old palace of the Lombard kings, once celebrated for its grandeur and magnificent collections, but now only a gloomy ruin, partly fitted up as a barrack; the theatre, and several towers, once so numerous that Pavia was surnamed 'the city of the hundred towers.' Of the few still existing those of Belcredi and Maino are the most conspicuous, and are each about 190 feet high. The university, founded, it is said, by Charlemagne, is one of the oldest in Italy, and in its palmiest days, about the beginning of the sixteenth century, was attended by about 3000 students. In 1882 the students numbered 724. The buildings which it occupies have little to recommend them beyond their size, and the regularity of their construction; but the library of about 130,000 volumes is valuable, and the collections include, among others, one of the best anatomical museums in existence. Besides the university, there are three colleges connected with it, a gymnasium, an ecclesiastical seminary, a school of painting, a school of design and sculpture, an institute of fine arts, &c. Beyond the walls, but connected with its educational establishments, are botanical and agricultural gardens. The chief charitable endowments are a large and well-endowed general and two orphan hospitals. Pavia has not a single manufacture of any importance, and its traffic is almost solely confined to the supply of its own local wants.

Pavia was a place of considerable importance during the reign of Augustus. It afterwards came into the possession of the Lombard kings, who made it their capital, and erected many edifices, more remarkable for magnitude than taste. Near it, on 24th February, 1525, the Imperialists defeated the French, and took their king, Francis I., prisoner. Pavia has given birth to many distinguished men, among whom are Pope John XIV., and Lanfranc, afterwards Archbishop of Canterbury. Pop. 29,836.—The province of Pavia, which extends on both sides of the Po, has an area of 1285 square miles. The district of Bobbio is entirely covered by the Apennines, that of Voghera partly so. Those of Lomellina and Pavia form a fertile plain. Pop. (1881), 469,831.

PAVILION, at Brighton, England, a building erected in 1784 for the then Prince of Wales. It was a favourite residence of George IV., and its name sometimes occurs in connection with important measures agitated there. See BRIGHTON.

PAVLOGRAD, a town, Russia, 16 miles north-east of Ekaterinoslav, and in the government of that name. It is mostly built of wood. Pop. 11,391.

PAWNBROKERS. The business of a pawnbroker is to lend money on pledges. Although this mode of borrowing is occasionally taken advantage of by all classes, and bankers, when they accept security for their advances, act on the same principle as the pawnbroker, the business, as a special one, originates chiefly in the necessities of the poor. The usury and other abuses to which the necessities of borrowers of this class are liable to give rise has led, on the Continent, to the establishment of charitable institutions (see MONT DE PIÉTÉ), where the business is conducted on benevolent principles. In this country, where everything seems to flourish best under private management, the same plan has been tried, but it has failed. The trade of a pawnbroker may be thus said, in a sense, to be peculiarly a British institution; but the object which has been aimed at by monts de piété has here been attempted to be accomplished by placing the trade under certain legal restrictions.

In the middle ages lending upon pledges was a trade exclusively pursued by Jews and Lombards. In France, before the establishment of monts de piété, the trade was regulated by law. During the revolution the monts de piété were at first abolished as a monopoly, but the abuses to which the restoration of private pledging gave rise soon led to their re-establishment and the prohibition of private pledging, which is still maintained.

In England the common law recognizes the property of the pawner in the goods he has pledged, which cannot be forfeited by, or taken in pledge for, the debts of the pawnee, who is responsible for their safe-keeping. On the other hand the pawnee is recognized as having a qualified property in the goods, which cannot be put in execution by a creditor of the pawner till the debt for which they are pawned is satisfied. The property of goods of which the pawner is outlawed is in the king. Perishable goods are at the risk of the pawner, if he does not redeem them in time. Goods pawned without a fixed time of redemption may be redeemed at any time within the life of the pawner. A broker who refuses to deliver goods pawned on tender of payment may be indicted. Pawnbrokers were recognized by statute in the reign of James I. They were required to take out a license by act 25 Geo. III. cap. xlviii. (1785). The trade was regulated and its profits fixed by 39 and 40 Geo. III. cap. xcix., and various amendments have since been made on the law. The act 35 and 36 Vict. cap. xciii. (1872) was passed to consolidate all the acts relating to pawnbrokers in Great Britain; but it does not extend to Ireland, where pawnbroking is still regulated by the act 28 Geo. III. cap. xliii. This act is known as the Pawnbrokers' Act, 1872. To prevent evasion of the act, every person who keeps a shop for the sale of goods and chattels, and pays or advances any sum of money thereon not exceeding £10, on an agreement, express or implied, that these goods or chattels may afterwards be repurchased or redeemed, shall be deemed a pawnbroker. Executors of deceased pawnbrokers are bound, but not personally, except for their own acts, by its provisions. Pawnbrokers are liable for their assistants. Pawners' rights, when represented by instruments, pass to assignees or executors. The act applies to any loan whatsoever under 40*s.*, and to any loan between 40*s.* and £10 not authorized by special agreement permitted by the act. It does not apply to loans above £10. The pawnbroker is to use books and schedules as provided in the act. The name and surname of the broker, together with the words pawn broker, are to be put in large characters over the outer door of his shop. The information to be printed on pawn-tickets must also be posted in a conspicuous part of his shop. Pawn-tickets are to be given for pledges. Profits and charges are fixed by a schedule, of which the following are the principal provisions: —On a loan of 40*s.* or under, ½*d.* may be charged on every 2*s.*, or fraction of 2*s.*, for any period not exceeding one month. For every month after the first, including the last fraction of a month as an entire month, ½*d.* for every 2*s.* On a loan of above 40*s.*, ½*d.* per month on every 2*s.* 6*d.*, or fraction of 2*s.* 6*d.* The pawn-ticket may be charged ½*d.* for loans under 10*s.*, and 1*d.* above 10*s.* One ½*d.* may be charged for the inspection of an entry of a sale; ½*d.* for a form of declaration for a loan under 5*s.*, 1*d.* for a loan

above 5*s*. Pledges are redeemable for one year, with seven days' grace; but if the pledge is for a loan of more than 10*s*., it shall continue redeemable until disposed of under the provisions of the act. Pledges for more than 10*s*. must be disposed of by public auction, subject to regulations in schedule. The entry of sale may be inspected within three years by the pledger in the broker's books, and in the catalogue of sale certified by the auctioneer, and he may claim any surplus above loan and profit with the necessary charges. Brokers contravening the act as to loans above 10*s*. are liable to a penalty not exceeding £10 to the person aggrieved. Special agreements may be made on loans above 40*s*., provided a special ticket be delivered for them. Goods damaged by fire are to be paid under deduction of loan and profit, with 25 per cent. of additional charge on loan. A printed form of declaration, to be got from the pawnbroker, may be filled up by any one who has lost his ticket, under penalty of perjury for false declaration. A court of summary jurisdiction may restore to the owner property unlawfully pawned, with or without payment of loan. Pawnbrokers are prohibited from taking pledges from persons apparently under twelve years of age, or in a state of intoxication, from purchasing tickets issued by other brokers, from allowing any assistant under sixteen to take pledges, from carrying on business on Sunday, Good-Friday, Christmas-day, or a day appointed for a public fast or thanksgiving. The prohibition to carry on business on Good-Friday or Christmas-day does not extend to Scotland. Unlawful pawning is subject to a penalty of £5, in addition to a sum not exceeding the value of the pledge. If a person offers an article in pawn without giving a satisfactory account of the way in which he became possessed of it, or attempts to redeem an article without title, he may be detained by the broker, and handed over to the police to be brought before a justice, and dealt with according to law. Goods intrusted to another by the owner for manufacture, repair, &c., cannot be pawned; and the owner may, on making oath that he believes a pawnbroker to have taken such goods, obtain a warrant to search his premises. The pawnbroker must take a yearly license, expiring on 31st July, which costs £7, 10*s*. It may be forfeited for fraud or dishonesty. Penalties for offences against the act are in general not to exceed £10.

PAWTUCKET, a town, United States, Providence county, Rhode Island, on both sides of the river, at the falls (50 feet high) of the same name, and on the railways from Boston to Providence and from Providence to Worcester. It occupies a pleasing site; has eleven churches, numerous and extensive cotton-mills, print-works, and machine-shops; considerable manufactures of boots, shoes, carriages, chairs, and cabinet-wares; building-yards, and an extensive trade. The first factory for weaving cotton cloth by water-power in the United States was erected here in 1790. Pop. in 1870, 6619; in 1880, 19,030.

PAXO (anciently *Paxos*), one of the Ionian Islands, Kingdom of Greece, 9 miles south of Corfu. It is nearly 5 miles long and 2 broad, and consists of a mass of limestone rock. Principal product, olive-oil of the finest quality. Pop. 3582.

PAXTON, Sir Joseph, a celebrated English landscape-gardener and architect, was born at Milton-Bryant, in Bedfordshire, in 1803. He was educated at the free school of Woburn, and being the son of poor parents had to earn a livelihood by his own exertions at an early age. He became a gardener, and was employed in the Horticultural Society's Gardens at Chiswick. While there he happened to attract the notice of the Duke of Devonshire, who made him head-gardener at his seat of Chatsworth, in Derbyshire, and latterly manager of all his estates in that county. In 1838 he published a Treatise on the Culture of the Dahlia, and in 1840, in conjunction with Lindley, a Pocket Botanical Dictionary. The great Conservatory at Chatsworth, 300 feet long by 145 wide, built from his designs, no doubt suggested to him the idea of the Crystal Palace, the magnificent structure of iron and glass planned by him for the great Exhibition of 1851. It was built in Hyde Park, London, and when completed excited universal admiration. Paxton became at once famous, and received the honour of knighthood. The Crystal Palace was removed, and under his direction rebuilt with great additions at Sydenham, where, with its grounds, also laid out by him, it forms one of the chief attractions of the metropolis. He was elected member of Parliament for Coventry in 1854, and continued to represent it till his death, which took place, 8th June, 1865, at his residence, Rockhills, Sydenham.

PAYMASTER, an officer in the British army and navy. In the army there is a regimental paymaster for each battalion of infantry and each regiment of cavalry, who holds the rank of captain, or after lengthened service of major. He has to pay the officers and the men through their respective captains. In matters of general discipline the paymaster is subordinate to the commanding officer of his regiment; but in regard to the immediate duties of his office he is directly responsible to the war-office. There are also paymasters for the various regimental districts, as well as for the larger military divisions of the country. The paymaster of a ship in the navy has a general charge of the financial department in the vessel, and of the provisions as well as of the payment of the men. Until 1844 he had the title of purser.

PAYMASTER-GENERAL, a British government officer whose duties were formerly limited to the army, but who now acts as paymaster-general of all the services. The office was formerly lucrative, as the interest of the money which remained in the hands of the paymaster formed part of its emoluments. It was limited in 1782 to a fixed salary. It is now usually attached to the vice-presidentship of the board of trade, with a salary of £2000. The paymaster-general is *ex officio* a privy-councillor. Formerly he was sometimes a member of the cabinet.

PAYS DE VAUD. See Vaud (Canton of).

PAZ (La) DE AYACUCHO, a city of Bolivia, capital of a department and a province of the same name, stands in a deep ravine, the Quebrada-de-Choquehapu, 620 feet below the level of the Lake of Titicaca, yet 12,195 feet above sea-level; lat. 16° 29′ 54″ s.; lon. 68° 29′ 38″ w. The ravine of La Paz descends south-east; the stream which flows through it, from and round Illimani, the snowy summits of which are seen east by south, is one of the chief sources of the Amazon. The city is built in an amphitheatre on both sides of the ravine; but the public edifices are chiefly on the left bank. Nine fine bridges unite the two quarters, each of which is subdivided into several other sections by deep ravines. Of the churches the Sagrario or cathedral claims most attention, being large, and effectively, though somewhat coarsely, ornamented with figures of angels executed in basalt. Opposite to the cathedral is the Plaza Major or principal square. There are also a college of sciences, a seminary, a school of mechanical arts, a university, and an academy of jurisprudence. Nine-tenths of the inhabitants are Aymara Indians, whose national costume, as well as language, prevail in it. The foundation of Nuestra Señora de la Paz dates from 1548. The town being situated conveniently between the fertile valleys of the Yungas and the port of Arica, soon rose to importance. In 1605 it was made

the seat of a bishopric, and in 1825 changed its name to La Paz de Ayacucho, in memory of the victory which completed the liberation of the republic. Pop. 76,372.—The department lies between lat. 12° and 17° s., consisting chiefly of those valleys which lie between the Andes and the Rio Beni, and form the latter by the junction of their streams. It is divided into seven provinces, with an area of 43,052 square miles, and a population estimated at 475,322.

PAZZI, a distinguished Florentine family, famous for a conspiracy against Lorenzo and Giuliano de Medici in 1478. See MEDICI.

PEA (*Pisum sativum*). The native country of the pea is unknown, but it is commonly referred to the south of Europe. It has been cultivated from remote antiquity, and is now universally diffused, and forms one of the most valuable of culinary plants. It belongs to the natural order Leguminosæ. The root is annual; the stem herbaceous, divided often from the base into several cylindrical weak branches, trailing upon the ground, unless support is afforded; the leaves are pinnate, provided at base with large stipules, and terminated with tendrils; the flowers are axillary, usually disposed in clusters upon a common peduncle, and of a whitish, or sometimes reddish or purple colour; they are succeeded by oblong and almost cylindrical pods. The varieties which have been produced by cultivation are very numerous, and differ in the colour of their flowers, their number and that of the seeds, the time of ripening, and in stature, some being low plants of a few inches, and others attaining the height of 10 or 12 feet. Some varieties have pods destitute of the coriaceous inner film, which admits of their being boiled entire, and served up in the same manner as kidney-beans. Pease are nutritious, and, especially when green, form an agreeable article of food to most persons. When ripe they are used for soup, and are prepared by freeing them from the husks, and splitting them in mills constructed for the purpose. They are sometimes ground into flour, which is mixed with that from wheat by bakers, but the bread is rendered heavy and unwholesome. With rye-flour, however, in the proportion of one-fourth, they are said to afford a palatable and nourishing bread. Green pease are among the earliest products of the garden, and a succession may be kept up throughout the season by sowing at different periods of time. A second species, the *Pisum maritimum*, grows wild on the sea-shore. It resembles in form the preceding, and has large reddish or purple flowers disposed in racemes. The seeds are bitter and disagreeable, though it is said they have been collected for food in times of scarcity.

PEABODY, GEORGE, an American merchant distinguished for the philanthropic disposal of his wealth, was born at Danvers, Massachusetts, in 1795. He was educated at the district school of Danvers, and afterwards served in various mercantile situations. On the outbreak of the war in 1812 he volunteered into the United States army. He afterwards entered into a mercantile partnership with a capitalist named Riggs, and travelled for the firm chiefly in Maryland and Virginia. In 1830 his partner retired, leaving him at the head of a large concern, with branches in New York, Philadelphia, and Baltimore. In 1843 he retired from the American firm, and, coming to London, established a partnership under the firm of George Peabody & Co., which continued for a succession of years to do a flourishing business both in London and with the United States, as exchange brokers and money lenders. In 1848 he acted as a commissioner in extricating the state of Maryland from financial difficulties, for which he declined to accept of any remuneration. In 1851 he advanced funds to fit up the United States department in the International Exhibition. He gave £100,000 in 1852 to establish a free library and educational institution in his native town of Danvers. In 1857 he visited the United States, and presented £100,000, which he afterwards doubled, to found a free library and institute of art and science at Baltimore. In 1862 he placed £150,000 in the hands of trustees for the benefit of the poor of London, to be employed in building model dwelling-houses, and letting them at moderate rents. He afterwards added £200,000 to this benefaction during his lifetime. The Peabody dwellings have been erected in numerous districts of London. In 1866 he received the freedom of the city of London. He passed the next three years in America, where he made large donations to educational and philanthropic objects, for which he received in 1867 the thanks of Congress. He returned to England in 1869, and died in his house at Eaton Square, on 4th November, 1869. In his will he left another £150,000 to the London Peabody Fund, making in all £500,000.

PEACE, ARTICLES OF THE. By the common law of England justices of the peace in session, as well as certain special courts, are authorized as a measure of preventive justice to compel any person to enter into recognizances to keep the peace for such a period as they may deem necessary. The recognizance binds the person himself, together with one or more securities, for such an amount as the court may deem sufficient, which is forfeited in the event of the commission of any act from which the party is bound to refrain. The recognizance is voided by the demise of the sovereign in whose name it is made, and it may be discharged by order of the court by whom it is granted. According to some authorities the discretion of the court in determining the duration of the recognizance is limited to twelve months. The court may bind persons over to keep the peace at its own discretion, or on the complaint of a private individual that personal wrong or violence is threatened, or intended to be done to him. This complaint is called exhibiting articles of the peace. If the person accused cannot find security he may be committed to prison till next quarter-sessions. Wives may demand this security, if necessary, against their husbands, and husbands against their wives. The exhibition of articles of the peace was introduced into Scotland from the English law, along with the institution of justices of the peace.

PEACE, BREACH OF. See BREACH.

PEACE, JUSTICE OF THE. See JUSTICE OF THE PEACE.

PEACE, RELIGIOUS (German, *Religionsfriede*), the name given in German history to a series of treaties by which after the Reformation the Protestant states were secured in the exercise of their religion. There are two treaties which especially bear this name, that of Nürnberg, signed by the Protestants on 23d July, and confirmed by the emperor at Regensburg (Ratisbon), on 2d August, 1532, and that of Augsburg, Sep. 26, 1555. By the Treaty of Nürnberg the emperor engaged to convoke a council to settle all religious differences, and both sides agreed to suspend hostilities until the council should be convoked, while if the council was not convened a new compromise was to be made between the Protestants and Catholics. But respecting the claims of the Protestants, particularly as to the free exercise of their religion, no definite assurance was given. The Protestants gained by this peace only a temporary security. The emperor had by no means abandoned his plan of compulsion, but circumstances compelled him again and again to delay its execution. The Peace of Nürnberg was consequently six times renewed between 1534 and 1545. The peace with

France in 1545 gave the emperor the long-waited opportunity of breaking with the Protestants, to whom the Council of Trent, which met at the close of this year, left no hope of a peaceable settlement. The victory of Charles over the Schmalkaldic League seemed to have placed the whole of Germany at his mercy, when the unexpected hostilities of the Elector Maurice compelled him to accept instead of dictating the terms of a conqueror. By the Peace of Passau, 31st July, 1552, the right of the evangelical states to the free exercise of their religion was for the first time acknowledged, and the emperor promised to convene a diet within six months, to settle on a permanent basis the respective rights of the two religious parties, and the constitutional rights of the empire. The outbreak of war with France, the continuance of hostilities by Albert, margrave of Brandenburg-Kulmbach, who refused to accede to the Treaty of Passau, and the death of Maurice (1553) delayed the meeting of the diet, which took place at Augsburg in 1555, presided over by the Archduke Ferdinand, to whom the emperor had given full powers, and concluded the treaty above mentioned, known as the Religious Peace of Augsburg. No state of the empire on either side was to be disturbed on account of its religion; subjects were to be permitted to leave a state where their religion was not tolerated, and the Protestants were to retain all the ecclesiastical benefices in their hands at the time of the Peace of Passau. Two points, however, divided the diet: the Catholics insisted on inserting in the treaty a provision, called the Ecclesiastical Reservation, to the effect that if any ecclesiastic in possession of territorial or state dignities attached to a church title should abandon his religion, he should be held thereby to have resigned *de facto* his possessions and benefices. This was only admitted by the Protestants under protest. On the other hand, the Catholics positively refused to include in the treaty a stipulation in favour of liberty of worship for the Protestant subjects of ecclesiastical princes, and the Protestants were compelled to be content with the verbal promise of the Archduke Ferdinand, that until the final reconciliation of religious differences they should not be molested. Moreover the treaty only recognized Protestants of the Augsburg Confession. The Calvinists, who were becoming a powerful party in Germany, and soon became predominant in the Palatinate, were not included in it. These differences ultimately led to the Thirty Years' war, and it was not till the Peace of Westphalia, in 1648, which placed the Calvinists on the same footing with the Lutherans, that a permanent religious peace was established.

PEACE RIVER. See MACKENZIE RIVER.

PEACH. This is one of the most exquisite and wholesome fruits of temperate climates. The tree is of middling stature, but varies according to soil and climate. It belongs to the natural order Rosaceæ, sub-order Amygdaleæ. The leaves are alternate, simple, lanceolate, acute, and finely serrated. The flowers appear before the leaves, are very beautiful, and diffuse an agreeable odour. The fruit is a large downy drupe, containing a stone which is deeply furrowed and rough externally, which character distinguishes it from both the almond and apricot. The peach-tree is known to botanists under the name of *Amygdalus Persica*, or *Persica vulgaris*, and is supposed to have been introduced into Europe from Persia. It was first introduced into England about the year 1562. The varieties are very numerous, differing in size, flavour, and time of ripening; but they are principally of two sorts—the *free-stones*, in which the flesh may be easily separated from the stone; and the *cling-stones*, in which it is adherent. The nectarine is by some considered a mere variety of the peach, differing only in its smooth skin; and this fruit is likewise divided into cling and free stones. The peach is reproduced by planting the stones; but it is usual, when the stocks have attained a certain size, to graft upon them any required variety. Forty years are mentioned as the duration of the peach-tree. The peach is generally grown out of doors in the southern parts of Britain, but in most localities in Scotland it is grown only under glass. This fruit is extensively cultivated in the warm temperate districts of the United States, great quantities being canned for export, besides what is retained.

PEACOCK (*Pavo*), a genus of Rasorial or Gallinaceous Birds, forming the type of a sub-family (*Pavoninæ*) of the Pheasant family (*Phasianidæ*). The Pea-fowls possess a crest or tuft borne on the head. The upper tail-coverts of the males are greatly elongated, and form the brilliant train of feathers popularly designated as the 'tail' of these birds. The female birds want these appendages. The tarsus bears a single spur only. In their other characters the peacocks agree with the remaining members of the Pheasant group. The Common Peacock (*Pavo cristatus*) is a sufficiently familiar bird to obviate the necessity for a description of its general appearance. The length of the male bird, inclusive of the tail, is about 4 feet. The female birds are smaller, and their more sombre, brownish plumage presents a striking contrast to the brilliant appearance of their mates. The tail-feathers of the latter are marked at their tips by rounded spots of metallic lustre and iridescent hues, the general body-plumage exhibiting metallic tints, and the feathers of the neck particularly showing a beautiful golden-greenish lustre. The voice of these birds is short and harsh. The word *paon*, which is the French name for the peacock, imitates in some degree the normal voice or cry of the bird. The females, when past breeding, have been known, as is the case with some other birds, to assume the brilliant colours of the males. India appears to be the natural habitat of the peacock, but it is abundantly domesticated in Europe, and several varieties are enumerated among the tame species. The colours and plumage are said to be more brilliant in the wild state than in domesticated forms. In India the peacock is common in a wild state, these untamed specimens averaging an ordinary hen-turkey in size. The tail measures about 19 inches, the total length of body, inclusive of the tail, being about 4 feet 5 inches. The wild pea-hen lays from twenty-five to thirty eggs, and produces only a single brood in each year. The nest is of rude construction, and is placed on the ground. In a tame state these birds begin to breed at the end of March or beginning of April. The eggs are laid in a gradual manner, one egg being deposited every two days, and the entire number reaching ten or twelve. They resemble goose eggs in size, and are coloured white, with darker spots. The hens do not incubate steadily, but may frequently leave the nest. The period of incubation extends from twenty-five to thirty days. The young birds of both sexes are feathered alike for the first two years; and in the third year the tail-coverts of the male begin to be developed and to assume their lustrous appearance, when also the males begin to parade their attractions before the eyes of their mates. The third year is the first in which the young pea-hen produces eggs. The powers of flight are not strong, these birds chiefly perching at no great height from the ground.

In Bengal, Java, Sumatra, &c., shooting the wild pea-fowl forms a favourite amusement, and large flocks of these birds are occasionally met with by sportsmen. These birds occur wild in plenty in the neighbourhood of the Ganges in the flat lands of India, in

Guzerat, Cambay, the coast of Malabar, &c. From India the peacock was probably brought to Persia and Media. Aristophanes speaks of 'Persian Peacocks.' Suidas terms it the 'Median Bird.' The fleets of Solomon brought these birds to Judea. Alexander the Great brought them first to Europe; and they were first seen in Rome about the end of the republic, and speedily became objects of interest to the sybaritic tastes of the day. Pliny says that the orator Hortensius was the first who made a table delicacy of these birds, this worthy presenting them at a feast given to the College of Augurs. Vitellius and Heliogabalus introduced at their feasts dishes composed of the brains and tongues only of peacocks. In the middle ages in Europe peacocks were still deemed meet dishes for the tables of the great, although in modern times the flesh is accounted coarse and tough. In ancient Greece, in the time of Pericles, these birds brought high prices. From India they were brought to Asia Minor, and thence into the Isle of Samos, where they were bred and consecrated to Juno, who was alleged in mythological legends to have adorned its tail with the eyes of her favourite Argus—'et gemmis caudam stellantibus implet.' From Europe they were probably in turn introduced into Africa and America.

The food consists of grain of various kinds, but the young in temperate climates usually require some attention in rearing. In certain cases the peacocks will feed on a very miscellaneous diet. These birds are polygamous. The plumage of the males is shed annually; and the cry of these birds is popularly said to be repeated before the fall of rain. The pea-fowls are said occasionally to live to a great age. Aristotle fixed the duration of their life at twenty-five years; Willoughby and others alleged that they might live for a century, as also did Ælian. From twenty to thirty years appears to be the average limits of their existence.

The Black-shouldered or Japan Peacock is generally regarded as a variety of the common species. The Javan Peacock (*Pavo spicifer*) is a distinct form. The Chinese Peacock-pheasant (*P. chinquis* of Temminck, *P. Thibetanus* of Linnæus), Iris Peacock, or Thibet Peacock, as it is sometimes also termed, is found in China and the mountainous districts lying between Hindustan and Thibet. Sonnerat says that these birds also occur in Malacca. They are distinguished from the peacocks by the presence of two or more spurs borne on the tarsi—hence the name of *Pavo* or *Polyplectron bicalcaratus* sometimes applied to the best known species in place of the scientific appellations already mentioned. The tail-coverts in this form are not so elongated as in the true peacocks. They are reddish in colour, and each is marked by a double ocellated green spot. The tail appears composed of two distinct groups of feathers, the uppermost group being the true tail. The tail-feathers may be erected in a fan-like shape or depressed at will. When at rest they lie horizontally. The females, as in the peacocks, are less brilliantly coloured than the males. The two tarsi in the same bird may possess different numbers of spurs, which generally vary in number from two to six. Several distinct species of these latter birds are known.

PEAK, in nautical language, a name given to the upper corner of those sails which are extended by a gaff, or by a yard which crosses the mast obliquely, as the mizzen-yard of a ship, the main-yard of a bilander, &c. The upper extremity of these yards and gaffs is also denominated the *peak*.

PEAK, or High Peak, a district of England, forming the north-west angle of Derbyshire, and consisting of a wild and romantic tract, full of hills, valleys, and moors, and celebrated for its limestone caverns and grottoes, containing many remarkable natural curiosities. The hills are mostly bare and barren, or covered with a thin mossy verdure; the valleys are often richly wooded, and very picturesque. Near the village of Castleton, in this district, is the famous Peak Cavern, or Devil's Cave. This is a spacious limestone cavern, entered by a natural arch 40 feet high, and more than 100 wide. After about 100 yards the arch contracts, and the visitor has to stoop for a short distance, after which he enters a kind of vault, called the Bell House. Passing through another very narrow passage, along which runs a stream of water, the visitor enters a third cavern about 200 feet wide, and in parts 120 feet high. A number of other chambers follow, till all further advance is checked by the rocks closing in upon the stream that still continues to find its way through. This stream disappears about 3 miles from Castleton, and only appears in the open day at the mouth of the cavern. Among the other caverns of the Peak are Elden Hole, also near Castleton, a perpendicular chasm more than 180 feet deep, giving admission to interior caverns; and the Bagshaw Grottoes, extending about 2000 feet, and adorned with stalactites; besides others. Other objects of interest are the Mam Tor, or Shivering Mountain, so called from the frequency with which fragments become detached from it, with traces of a Roman encampment on the top; the ancient lead mines of Odin, at the foot of Mam Tor; and the Peak Castle, founded by William Peveril, natural son of the Conqueror, who has given name to Sir Walter Scott's novel.

PEAR, the fruit of the *Pyrus domestica*, a tree growing wild in many parts of Europe, and now cultivated in all temperate climates. The pear-tree belongs to the natural order Rosaceæ; sub-order Pomeæ. It is the largest of the genus, and reaches the height of 40 feet, with the trunk 2 feet or more in diameter. The leaves are simple, alternate, oval, and finely serrated. The flowers are white, about 1 inch in diameter, and are disposed in terminal or lateral corymbs. The fruit in a wild state is regularly turbinated, about 1 inch either way, and to the taste is austere until perfectly ripe, when it becomes soft, juicy, and not disagreeable. In the cultivated plant the fruit varies exceedingly in size, colour, taste, and time of ripening. The culture of the pear is very ancient, and several varieties were known to the Greeks and Romans. At the present day more than 200, fit for the table, are enumerated, and constant accessions are made every year; for the seeds never reproduce the same variety without more or less modification. These varieties are perpetuated only by grafting; they differ in colour, being either greenish, yellowish, grayish, or reddish; in the consistence of the pulp, dry and firm, or melting and watery; and in taste, insipid, austere, acid, or sugary. A constant succession may be had from the beginning of summer throughout the winter. France and the north of Italy are celebrated for the perfection to which they have carried the culture of this fruit. Even in districts where it grows wild the tree is very liable to injury from frosts, which greatly diminish its bearing. There are, besides, numerous varieties of pears cultivated solely for the purpose of making perry, a liquor analogous to cider, and prepared nearly in the same manner. This in general is less esteemed than cider, though often very agreeable; indeed many of the dealers in Champagne wine are said to use perry in the adulteration of it. The wood is fine-grained, of a yellowish colour, and susceptible of a brilliant polish; it is not subject to the attacks of insects, and receives a black dye. In the early ages of Greece this wood was employed in statuary; now it is used for musical instruments, the handles of carpenters'

tools, and a great variety of mechanical purposes. Nine other species of *Pyrus*, as the genus is above restricted, are known, all natives of the temperate parts of the eastern continent.

PEARL, the name applied to a precious stone or concretion produced by certain species of molluscous animals as the result of some abnormal secretory process. The 'mantle' or pallium (see MANTLE) which lines the shell, and by which the shell is formed, is the agent whereby pearls are secreted. The production of a pearl is generally begun by the introduction of some foreign body, such as a grain of sand, within the mantle-lobes. The presence of this body has the effect of setting up an irritant action, resulting in the deposition by the mantle of a quantity of nacreous material over the offending particle. This material, in certain species of molluscs, is of such a texture and character, and is so deposited in regular laminæ or layers, that in due time the structure known as a 'pearl,' varying in worth and brilliancy, is formed. The nucleus or central particle of a pearl will therefore be found in most instances to consist of such a foreign body as that above alluded to. And the Chinese and other eastern nations, knowing the details of the pearl-producing process, are in the habit of introducing small particles under the mantle of the molluscs, and of thus procuring in due time artificial pearls. Small metallic figures or images may sometimes be seen which have been coated with a pearly or nacreous deposit through their introduction within the shells of certain molluscs—notably a species of the genus *Meleagrina*, in which genus the Pearl Oyster is included. It would appear that only in certain kinds of molluscs is the nacre or mother-of-pearl secretion of the texture and nature adapted to form and produce the valued 'pearl.' Chief amongst such molluscs are the Pearl Oyster (*Meleagrina margaritifera*) and the Unios or fresh-water mussels of our own rivers. The former is found in the Persian Gulf, in Japanese waters, &c., but is chiefly fished and obtained in the Bay of Bengal, at Ceylon, and on other coasts of the Indian Ocean. The Meleagrina is not, strictly and zoologically speaking, an oyster. It is included, not in the Ostræidæ or Oyster family, but in that of the Aviculidæ, a nearly related group. The shell is rounded in form, and usually coloured greenish on the external surface. The animal moors itself by a beard or 'byssus,' like the common mussel. The chief fisheries are those of Ceylon, which, together with the fisheries in the Persian Gulf, were known to the ancients. The chief seat of the Cingalese fishery exists in the Gulf of Manaar, a bay on the north-east aspect of Ceylon. It begins in February or March, and extends over a period of about a month. A fleet of about 250 boats are engaged in the fishery, each boat being manned by about twenty hands and a negro. The time for beginning the fishing operations is at day-break, and is indicated by a gun being fired. The rowers number ten; whilst the divers, also ten in number, are divided into two groups of five in each group, the one gang resting whilst the other is employed in diving. The average depth at which the oysters are found varies from 60 to 70 feet, and to these depths accordingly the divers descend, being let down into the sea-depths by a stout rope weighted by a heavy stone weighing about 56 lbs. or more. The right foot of the diver is placed on the stone or in a loop of the rope, whilst the left foot is used to retain the net in which the oysters are to be stored. The right hand grasps the signal-cord, by means of which the diver's wishes are communicated to the boat above; and the left hand is used to press or close the nostrils. Thus placed, and naked, save for a cloth around the loins, the diver descends; and having reached the bottom, the stone is pulled up. Laid on his face, he quickly gathers the oysters, and places them within the net. At the end of thirty seconds he generally signals to be pulled up; the longest period possible for the divers to remain under water being stated to be about eighty seconds. The same diver may descend from three or four to even twenty times in a day. The fishing ceases about mid-day. The divers frequently bleed from the nose, mouth, and ears, on account of the severe pressure to which they are subjected; and they are also exposed to danger from the sharks. A knife is generally carried by way of protection against these fishes; and the native priests on shore exact fees to keep up a beating of drums and to say prayers for the assumed protection of the divers from their finny enemies. The owners of the boats wait and superintend the landing of the precious cargoes, the oysters being carried to shore, and laid in piles on mats of esparto grass. In about ten days the oysters become thoroughly decomposed, the smell in the neighbourhood of the putrefying heaps being said to be almost unbearable by a stranger unaccustomed to the scene. The object of thus allowing the molluscs to decompose is that of insuring their being easily opened and examined in the soft putrefying state, without fear of injuring the concretions they may contain. They are thrown into sea-water, and are then carefully examined for pearls; whilst the shells, after being cleaned, are split into layers for the sake of the nacre or mother-of-pearl substance of which they are composed. This nacre is commercially known in three forms—the 'silver-lipped' of India, China, and Peru; the 'bastard-white;' and the 'bastard-black' nacre. The first mentioned is the most valuable; it is imported in cases weighing from 250 lbs. to 280 lbs. each. The second kind of nacre is imported in casks of about 250 lbs. weight; this latter variety is coloured yellowish or greenish, or may exhibit reddish or bluish tints. The nacres are used chiefly for the purpose of inlaying wood and marqueterie work.

The pearl-fisheries of Ceylon are under government control and inspection, the coast being officially inspected each season. The fishings may be let, or may be retained in the interests of the government of Ceylon. Of late years the Ceylon pearl-fisheries have been unproductive, chiefly, it must be presumed, from over fishing and the want of definite knowledge respecting the habits of the oysters, with a view to their cultivation and due preservation. In 1797, the first year in which government obtained the control of the fisheries, the annual produce was £144,000, and in the following year, 1798, it rose to £194,000. But these favourable conditions after that period at once fell off, until the beginning of the present century, when the fishing prospects again improved, the ground being let to private speculators under certain wise restrictions as to the extent of ground to be fished. During the ten years 1863–73 the pearl fisheries of Ceylon again greatly declined, but they revived in 1874, and a good return was again obtained from these fisheries in 1881. James Steuart, Esq., of Colpetty, in his Notes on Ceylon, gives much interesting information regarding the Ceylon pearl-fisheries. This gentleman remarks that in 1851 it was first determined by the late Dr. Kelaart that although the pearl-oyster had no power of detaching its byssus or 'beard' from the rock, it yet could detach itself in turn from the byssus, and could move to another spot, there to form a new byssus. This power of changing the position may therefore in some degree have affected the apparent scarcity of the oysters in certain parts of the fishing-grounds. The pearls appear to vary in colour and size, according to the nature of the ground on which the oysters

rest, and in the kind of food supplied to them. The pearls are sometimes of so inferior quality that the cost of fishing is hardly or not at all repaid.

When the pearls are found adhering to the valve or shell they are carefully detached with pincers; more commonly they are found imbedded amid the putrefying tissues of the oysters, the soft parts being carefully examined, boiled, and strained, so as to detect and secure the more minute pearls, which would otherwise be overlooked. The pearls found attached to the nacre of the shell are of inferior quality, and are disposed of by weight. The finest pearls are those found within the soft parts of the oysters. These latter are generally large, and occur singly. They are termed *virgin pearls* or *paragons*, and are sold at so much per pearl. They are generally of spherical or pear shape, and are subjected to a preliminary process of being polished by being rubbed in a bag with powdered nacre. Thereafter the mass of virgin pearls is passed through a series of copper sieves, the meshes of which are of various sizes, with the view of separating the larger and of thus fixing a standard of size and worth. There are generally twelve sieves set one within the other, and each is pierced with a certain number of holes, varying from 20 to 1000. The pearls which do not pass through any sieve containing above eighty holes are of the larger size, and are named first-class or *mill* pearls. Those which lie between the sieves containing from 100 to 800 holes are known as *viradoe* pearls or those of the second class. Those which pass through the remaining sieves, and at length reach the 1000-holed sieve, are the smaller or *seed* pearls, the latter being sold by weight or by measure. The larger pearls are threaded, and are exposed for sale in rows. The American pearl-oysters are opened by knives, and the pearls are sought for at once among the fresh tissues of the animal—a process which, though less certain of securing the concretions, is yet said to have the merit of obtaining them in a fresher state, and less liable to discoloration.

The Indian pearl-fisheries of the Bay of Bengal, those of Japan, of China, and of the Eastern Archipelago, are estimated to yield an annual produce of about £800,000. The fisheries of the Isle of Bahrein, on the coast of Arabia, in the Persian Gulf, produce about £240,000 annually; all the Arabian fisheries yielding an annual total of about £350,000. The South American pearl-fisheries of the Mexican coasts, and of the Islands of Panamá, Margarita, &c., were formerly in high repute. In the time of Charles V. of Spain these fisheries sent pearls to that country of the value of £160,000. The present value of the South American fisheries is stated as averaging about £60,000 annually.

Pearls have formed valued articles of decoration and ornament from the very earliest times. Pliny tells us of the enormous extent in which they were used by the ladies of classic Rome. Seneca reproached a patrician for the extravagance of his spouse, by saying that the lady wore all the wealth of his house in her ears. Julius Cæsar presented Servilia, the mother of Marcus Brutus, with a pearl valued in modern computation at £48,000. Clodius, the son of the tragedian, was said to have swallowed one gem valued at £8000; whilst Cleopatra's similar escapade disposed of a pearl said to be worth £60,000 or £80,000 of our coin. This queen is also said to have possessed a second pearl of equal value. A Panama pearl, said to be of the size of a pigeon's egg, and presented in 1579 to Philip II. of Spain, was valued at £4000; a prince of Muscat possessing another so clear and transparent that, though only weighing 12 carats, it was estimated to be worth a similar amount. A Spanish lady of Madrid in 1605 was the happy possessor of one gem valued at 31,000 ducats. Pope Leo X. obtained one in Venice worth £14,000; and from Venice a pearl was presented to Sultan Soliman the Great, the value of which was estimated at £16,000. A pearl purchased by the traveller Tavernier at Califa is alleged to have been sold by him to the Shah of Persia for £180,000. A Margarita pearl obtained in 1587, and weighing 250 carats, was valued at £150,000. The 'Pilgrim' pearl of Moscow is diaphanous in character, and weighs 24 carats. And many other instances might be cited of large-sized jewels of this kind, the values of which were proportionally high.

As mentioned in the article MUSSEL (which see), pearls have also been obtained from the Unionidæ or Fresh-water Mussels of Scotch rivers and streams. The Scotch pearls were famed even in the middle ages, and, as mentioned in the article above alluded to, pearls to the value of £10,000, from the Tay and Isla, were sent to London between the years 1761–64. In 1864 Mr. Unger of Edinburgh, to whose exertions as a dealer in gems the revival of the Scotch pearl-fishery was chiefly due, calculated that £10,000 represented that year's value of the fishings. Some Scotch pearls have brought as high prices as £60 each. About 1860 may be taken as the date of the revival of the Scotch pearl-fisheries. Many rivers in Ireland and Wales also furnish supplies of pearls. The Conway has thus been long noted for its pearls, and the Irt of Cumberland also afforded the valued gems. At the present date (1884) the Scotch pearl-fishery has greatly declined, owing to the reckless way in which the rivers have been devastated.

Pearls are also found in the Elster, a river in the Voigtland, in the Kingdom of Saxony, from its origin down to the small town Elsterberg, as well as in the rivulets which fall into the Elster. Since 1621 a pearl-fishery has been established there, of course for the benefit of the sovereign. Also in the river Watawa in Bohemia, and in the Moldau River from Krumau to Frauenberg, pearls are found, sometimes of great beauty, and difficult to be distinguished from the oriental pearl. The latter fishery is the property of the owner of the land.

There is a very curious passage in Philostratus (Life of Apollonius), in which Apollonius the philosopher relates that the inhabitants of the shores of the Red Sea, after having calmed the sea by means of oil, dived after the shell-fish, enticed them by means of some bait to open their shells, and having pricked the animals with a sharp-pointed instrument, received the liquor that flowed from them in small holes made in an iron vessel, in which it hardened into real pearls.

Pearls were formerly used in medicine, but their therapeutic effects are not different from those of any other calcareous earth.

PEARL, MOTHER OF. See MOTHER OF PEARL.

PEARL ASH, the common name for carbonate of potassium. See POTASSIUM.

PEARL POWDER, a name given to the white oxy-salt of bismuth obtained by adding water to a solution of the metal in nitric acid. See BISMUTH.

PEARL STONE, a felspathic mineral, consisting of silicate of aluminium with varying quantities of iron, lime, and alkalies; it occurs in spherules, which have a pearly lustre.

PEARLY NAUTILUS. See NAUTILUS.

PEARSON, JOHN, an eminent English prelate, born at the village of Snoring, in Norfolk, about 1613; was educated at Eton, and after studying at Cambridge, took orders in 1639. After officiating for some time on the living of Torrington in Suffolk, to which Lord-keeper Finch had presented him, he removed to London to the living of St. Clement East-

cheap, the duties of which parish he performed with great fidelity, ability, and acceptance. On the Restoration he was made prebendary of Ely, archdeacon of Surrey, and master of Jesus College, Cambridge; in 1661 he was appointed Margaret professor of divinity; in 1662, during which year he took part in the Savoy Conference, he became master of Trinity College; and in 1672 he succeeded Wilkins, the ingenious author of the Essay towards a Real Character, as Bishop of Chester, at which town he died in 1686. All his writings are so much distinguished by solid worth that it has been emphatically said that the very dust of them is solid gold. His Exposition of the Creed, by which he is best known, embodies the substance of a series of lectures delivered to his parishioners of St. Clement's. The text is accompanied by learned and elaborate notes, much more voluminous than itself, and the whole work, which has long formed an approved text-book for the examination of candidates for holy orders, still ranks as one of the best systems of theology in existence.

PEASANT-PROPRIETORS. There appears to be no natural distinction between this and any other kind of land-owners, and the term derives its specific meaning and importance from the theories of a class of economists represented on the Continent by Sismondi, and in this country by John Stuart Mill. A peasant-proprietor is a land-owner who cultivates his own land; but he must also be a small land-owner, and no very exact limit is assigned to the extent of territory which he may possess without forfeiting his right to belong to this particular class. The subdivision of land as the best means of improving the character of the peasantry and increasing the productiveness of agricultural labour is the doctrine which the observations regarding peasant-proprietors are adduced to prove; and as the observations themselves belong to a class of which the whole value depends on the light in which they are placed, it is impossible to present them without some critical estimation of their relation to the theory they are designed to prove. In our article LAND (PROPERTY IN) we have already discussed the theory itself. One general observation may, however, be made here. What we have to seek is either some evidence that peasant-properties are the natural outcome of a free development of labour, or some reason why the development of labour should not be free. To describe the advantages of a class which can exist only in exceptional circumstances or under exceptional legislation is of no service towards establishing a general doctrine of political economy; and if we find that where peasant-proprietorship is general there is reason to believe that its prevalence is due either to restrictive legislation or to a backward state of industrial organization, its advantages to the class more immediately concerned will hardly be held to afford a sufficient justification for its artificial maintenance.

The facts we have to adduce are taken from the Political Economy of John Stuart Mill (book ii. chap. 6 and 7), who has been at great labour to collect them, and where many more details will be found than we have space to give.

Mr. Mill begins by citing with approval some general observations by Sismondi, which, as well as the details which follow, excite considerable astonishment when considered in connection with his (Mill's) theories that land is a common property which cannot be alienated, and that the right of transmission to heirs does not form an essential part even of the principle of private property. Sismondi begins, in the passage cited, with a glowing description of the happiness of the Swiss peasant, which we have not space to copy. It strikes us that it might be paralleled by an account of the domestic arrangements of an English nobleman. If the question is how to produce the maximum of human happiness in individual cases the most effectual plan is surely to limit the number of the privileged class. We have already referred (Property in Land) to the admission of M. de Lavellaye, a recent supporter of the communistic principle, of the exclusive character of the land-tenure in the Swiss communes.

It is much more important to notice how Sismondi defines the class which is the subject of his eulogy. 'The peasant, who, together with his children, performs the whole labour of cultivating his little inheritance, *who pays no rent to any one above him, and no wages to any one below him*, who regulates his production by his consumption, who eats his own corn, drinks his own wine, clothes himself with his hemp and wool, cares very little about the fluctuations of markets; for he has little to sell and little to buy, and he is never ruined by the revolutions of commerce.' M. Sismondi adds somewhat inconsistently, 'Finally, of all cultivators the peasant-proprietor is he who gives most encouragement to commerce and industry, because he is the richest.' The clause we have italicized completes our definition of the peasant-proprietor.

Now is this anything more than a preference for an earlier over a later, a simpler over a more complex organization of industry? Sismondi himself answers. After enlarging on the incessant industry inspired by hereditary possession ('a few moments of labour suffice to plant the seed which in a hundred years will be a great tree'), he adds, 'The peasant is keenly alive to the happiness of being a proprietor, and he is always eager to buy land at any price. *He pays more for it than it is worth.*' This is the conclusion of the whole matter. The peasant-proprietor is the greatest enemy of peasant-properties. It is only his friends that are anxious to preserve them. He may not be solicitous to revive the antiquated institution of rent, unless he should ultimately be able to do so in his own favour; but it is to be feared that he would have no objection to pay wages if he could afford it. To exalt the happiness of a class which is anxious to quit its own position, and to insist on rendering that position permanent, is necessarily to invoke external force—at least the force of constraining circumstances—and not to depict a condition which can ever be made an object of ambition for its own sake. In all the facts which follow the reader will observe the struggles of a transition stage, struggles supported solely by hopes which those who wish to render them permanent would begin by cutting away. This is the more necessary to be noticed as on the Continent, to which Mr. Mill appeals for his evidence, it is obvious that political causes have retarded the organization of industry, which, until recently, has never there enjoyed even the limited freedom, and much less the security, which has done so much for it in this country. The wide-spread existence of peasant-properties on the Continent is due to a variety of causes, both social and political; but one observation, we believe, will be found to apply to it wherever it exists—that it has never been subjected to the test of a free competition. Wherever that competition sets in the tenure of land, as of every other kind of property, will obey the fluctuations produced by the varying strength, capacity, and fortunes of individuals. Mr. Mill's facts, however, are valuable, though for a different purpose from that they were intended to serve. They will probably satisfy any who will duly consider them of the general inexpediency of any restrictions on the transference of landed property.

Sismondi's picture, Mr. Mill observes, of 'unwearied assiduity, and what may be called affectionate interest

in the land,' is borne out by English observers in regard to the more intelligent cantons of Switzerland. Of Zürich Mr. Inglis says, 'When I used to open my casement between four and five in the morning to look out upon the lake and the distant Alps, I saw the labourer in the fields; and when I returned from an evening walk long after sunset, as late perhaps as half-past eight, there was the labourer mowing his grass or tying up his vines. It is impossible to look at a field, a garden, a hedging, scarcely even a tree, a flower, or a vegetable, without perceiving proofs of the extreme care and industry that are bestowed on the cultivation of the soil.' 'If you look into a field towards evening where there are large beds of cauliflower or cabbage, you will find that every single plant has been watered.' Of the Engadine he says, 'Generally speaking an Engadine peasant lives entirely upon the produce of his land, with the exception of a few articles of foreign growth required in his family, such as coffee, sugar, and wine.' 'He has also his own wool, which is converted into a blue-coat without passing through the hands of either the dyer or the tailor. The country is incapable of greater cultivation than it has received. All has been done for it that industry and an extreme love of gain can devise.' On the other hand Mr. Mill states that in Switzerland subdivision has been carried to an excessive degree, and the proprietors of those flourishing estates in Zürich are indebted to an extent which borders on the incredible, so that only the intensest industry, frugality, temperance, and complete freedom of commerce enable them to stand their ground. Mr. Laing gives similar testimony in regard to Norway, with the additional circumstance of the active use of co-operation among the small proprietors. On this point Reichensperger says, 'that the parts of Europe where the most extensive and costly plans for watering the meadows and lands have been carried out in the greatest perfection are those where the lands are very much subdivided, and are in the hands of small proprietors.'

Mr. Laing, who appears afterwards to have completely changed his views, says, 'If we listen to the large farmer, the scientific agriculturist, the political economist, good farming must perish with large farms; the very idea that good farming can exist unless on large farms cultivated with great capital they hold to be absurd. Draining, manuring, economical arrangement, cleaning the land, regular rotations, valuable stock and implements, all belong exclusively to large farms worked by large capital and by hired labour. This reads very well, but if we raise our eyes from their books to their fields, and coolly compare what we see in the best districts farmed in small farms, we see, and there is no blinking the fact, better crops in the ground in Flanders, East Friesland, Holstein—in short, on the whole line of the arable land from the Sound to Calais—than we see on the line of British coast opposite this line, and in the same latitudes from the Frith of Forth all round to Dover.' Of the Palatinate we have Mr. Howitt testifying that the peasant 'plods on from day to day and year to year, the most patient, untirable, and persevering of animals;' and we have the further testimony of Professor Rau to the gradual improvement of his methods. In Belgium we learn that land which can be compared to nothing but the sands of the sea-shore is conquered by the all-prevailing industry of the peasantry; and the observations of Arthur Young, in 1787–89, of the districts of France then owned by the peasantry, that 'the magic of property turns sand to gold.' But we need not multiply quotations which are all of a similar tenor. Our readers will be able to judge of the kind of evidence by which the partiality for peasant-properties is supported, and of the probability of their permanence under a free organization of labour. In Mr. Mill's seventh chapter he controverts the assertion that small holdings tend to over-population, a position in which, as far as regards the proprietors themselves, we have no difficulty in agreeing with him.

PEASANTS' WAR. This name is specially given in German history to a great insurrectionary movement among the peasantry of that country, which in 1525 spread over the whole of Germany. The immediate cause of this movement was religious fanaticism, but the pent-up forces by which it was impelled grew out of the long course of oppression to which feudal customs and priestly tyranny had subjected the people. The folly and feebleness of the insurrection were due to the ignorance of those by whom it was conducted; its strength, which under better management would have been formidable, to the pride and selfishness of the nobles and the secularity and licentiousness of the clergy.

As in France before the revolution, so in Germany at the time of the Reformation, the double yoke of civil and ecclesiastical bondage had been gradually growing heavier until it had become intolerable. In France the revolution, at whatever cost, entirely put an end to the ancient régime. In Germany, at this earlier epoch, the Peasants' war completely failed to accomplish its object; but the forces evoked by the Reformation, after a long and disastrous conflict, emancipated Germany from the feudalism and ecclesiasticism of the middle ages. Before the Reformation, particularly from 1476 to 1517, a series of popular commotions and insurrections had broken out in various parts of Southern Germany. One in Rhineland in 1502 was called from a particular kind of shoe worn by the insurgents, the *Bundschuh;* another in Würtemberg, in 1514, the League of Poor Conrad. Neither procured any relaxation of burdens. The demands of the insurgents were the abolition of villenage, or arbitrary feudal servitude, the diminution of tithes, the freedom of wood, air, and water; the restriction of ecclesiastical benefices to 60 florins. The peasants, like the nobles, interpreted the Reformation after their own fashion, and it gave a great impulse to their hopes of deliverance from the wrongs under which they laboured. Their revolutionary schemes were far from receiving any encouragement from Luther or Melanchthon, but there is never any want of men to flatter popular passions, and at this time unfortunately the leaders who presented themselves to the people were inflated with visionary enthusiasm. Karlstadt has been blamed for not imitating the caution of Luther and Melanchthon, but the chief promoters of the popular excitement were the sect of the Anabaptists, which at this time gave way to the wildest speculations, in which sensuality and fanaticism were blended with political extravagance. Their leader was Thomas Münzer, in whose life (see MÜNZER, THOMAS) an account of the rising of 1525 in Saxony and Thuringia will be found. A rising took place in Baden in 1522, another in Salzburg in 1523 against the Archbishop Matthäus Lang. In the following year numerous risings took place in various districts. In 1525 a manifest, containing twelve articles similar to those already mentioned, appeared and rapidly spread over all Germany. It is estimated that 150,000 persons lost their lives in these risings, which for the time gave a severe blow to the Reformation, in which many people supposed them to have originated.

PEASTONE, or PISOLITE, a composite limestone rock, composed of globules of limestone about the size of a pea, usually formed round a grain of sand, and joined with a cement of lime. In pisolitic rocks

PECCARY (*Dicotyles*), a genus of Ungulate quadrupeds, included in the Artiodactylate ('even-toed') section of that order, and nearly allied to the Swine, in which family (Suidæ) the genus is classified. These forms are exclusively confined to America, in which continent they represent the true swine of the Old World. In general form the peccaries resemble small pigs. The tail is very rudimentary. The fore-feet possess the ordinary two functional toes of the swine, in addition to the two short hinder toes which do not reach the ground; whilst the hind feet are provided with three toes only—one of the hinder or accessory toes (the outer one) being rudimentary. The canine teeth, generally so prominent in the male swine especially, do not protrude as in other Suidæ. The incisor and molar teeth resemble those of other swine. The peccaries possess a glandular sac or pouch, situated in the loins, which secretes a strongly-smelling fluid of fœtid nature. The Indians cut away this pouch immediately on killing a peccary, to avoid contaminating the flesh. The distinct bones of the metatarsus and metacarpus respectively are united. The peccaries form the only indigenous or native representatives of the Swine family in America. They are gregarious in habits, and congregate in flocks, generally of small size, and numbering from eight to ten individuals. The best known species are the Collared Peccary (*Dicotyles torquatus*) and the White-lipped Peccary (*D. labiatus*). The former occurs abundantly in South America, and also extends northwards into the more southern states of the Union. It is of smaller size than the other species. These animals appear to exist either in pairs or in small flocks, and inhabit holes or burrows in the ground, or live in the hollows of trees. The jaguars pursue the peccaries with great vigour. Their food consists of maize, potatoes, sugar-canes, and similar materials; and cultivated fields suffer much from their raids. The colour of this species, which averages about 3 feet in length, is a dark gray; the bristles being each marked by rings of gray, straw-colour, and black. The distinctive mark from which the specific name and character is derived consists of a band or ring of whitish colour, which passes down each shoulder from the withers, and round the throat, thus appearing as a kind of 'collar.' This species of peccary is readily domesticated. The flesh is savoury, but less fat than pigs' flesh. (Pl. CXCVI.–CXCVII. fig. 14.)

The White-lipped Peccary, found in Guiana and other parts of South America, congregates in larger bands than the collared species. They appear to migrate in flocks from place to place, and are said to swim well, although the Indians are also alleged to easily capture them when in the water. They are also said to attack sportsmen with great courage when exasperated. A white patch or strip exists across the chin, and extends backwards on each side of the jaw in this species.

PECTEN, a genus of Lamellibranchiate Mollusca, included in the Oyster family (*Ostræidæ*), and popularly designated under the name of 'Scallop-shells.' The Clam-shell or Great Scallop (*Pecten maximus*) was borne in the middle ages by pilgrims in their hats, as a sign that they had visited the Holy Land. Parnell thus remarks of the pilgrim:—

> 'He quits his cell, the pilgrim staff he bore,
> And fixed the scallop in his hat before.'

The shell is somewhat rounded, and terminates superiorly in a triangular 'ear,' in which the hinge exists. Both valves may be convex, or one may be more convex than the other. The hinge is not toothed; and the ligament, through the elasticity of which the shell is opened, is internal, and is situated in a depressed space at the hinge. A single adductor muscle only is developed. The 'foot' is of small size, and occasionally secretes a 'byssus' or *beard*. The outside surface of the shell is fluted more or less regularly, the internal surface showing similar markings. No nacre exists in the internal surface of the shell. The shell-edges may be smooth and unindented, as in *Pecten pseudamussium;* but are generally more or less wavy, or indented. The colours are generally marked and varied. The name 'Pecten' (Latin for 'comb') is derived from the indentation of the edges and surfaces of the shell. The edges of the mantle in the pectens are provided with numerous small pigment spots, supposed to possess the function of eyes, and hence known as *ocelli*. The appearance of these bodies, sparkling like brilliant jewels when the valves of the shell are unclosed, is a spectacle among the most beautiful presented by the Mollusca. The mantle-edges are also provided with tentacles or organs of touch. The scallops are able to move about by the forcible ejection of water from their shells, produced by the sudden closure of the valves—this process sending the animal backwards in the water, much after the fashion of the locomotion in the cuttle-fishes. Mr. Gosse maintains, however, that the backward impetus of the scallop is gained not by the forcible closure of the valves of the shell, but by the ejection of a stream of water through a certain part or point of the mantle, the edges of which are kept in firm apposition at all other points of its extent.

Numerous species of pecten—180 or more—are known. The Common Pecten (*P. operularis*), and the Frill or Great Scallop (*P. maximus*), are the most common forms. The latter form is esteemed a delicacy, and as such is sold in the London markets. The *P. Jacobæus* was the crest or emblem of St. James of Spain in the middle ages. *P. varius*, the Watered Pecten (*P. pseudamussium*), the Smooth-shelled Scallop (*P. glaber*), the White-mantled Scallop (*P. plica*) of the Indian Ocean, the *P. Japonica* of Japanese waters, the *P. nivea*, the Ducal Pecten (*P. Pallium*) of the Indian seas, the Purple Pecten (*P. purpuratus*), the Coral Species (*P. foliaceus*), the Tiger Pecten (*P. tigris*), the Foliaceous Pecten (*P. nodosus*), the Northern Pecten (*P. Islandicus*), &c., are all familiar to conchologists. (Pl. CXXX.–CXXXI. fig. 20.)

PECTOUS SUBSTANCES. Many parts of vegetables, as also unripe fruits, contain a substance called *pectose*, which is insoluble in water, but is transformed by the action of acids, &c., into *pectin*, a substance which is soluble in water. The juice of an unripe apple contains pectose, but no pectin; if it be boiled, however, the pectose is soon transformed into pectin by the influence of the malic and citric acids in the fruit. A somewhat similar action takes place in the fruit as it gradually ripens. This action is brought about principally by a ferment-like body called *pectase*, which is found in the fruit itself. This pectase has also the power of converting pectin into an acid substance called *pectic acid*. Pectin may be obtained from the juice of very ripe fruits; it forms a white amorphous mass, soluble in water, having a neutral reaction, and precipitable by alcohol; it contains about 45 per cent. of carbon, 5 per cent. of hydrogen, and 50 per cent. of oxygen.

PEDAL, any part of the mechanism of a musical instrument acted on by the feet. Pedals are used for different purposes in different instruments. In the organ they are used in two distinct ways; first to act on the swell and stops when the instrument is played with the hands; second, to act upon a distinct set of pipes, called the pedal organ, and which are played independently. On the pianoforte there was at first only one pedal used to raise the dampers and prolong the sound after the fingers were lifted from

the keys; a second was used to soften the notes, and is called the soft or una-corda pedal; a third has recently been introduced, which arrests the sound immediately after the note is struck, and produces an artificial staccato. In the harmonium the pedals supply the instrument with wind.

PEDEE, GREAT and LITTLE, two rivers in the United States. The former rises in North Carolina, near lat. 36° N.; flows, under the name of Yadkin, first east, then south-east, enters South Carolina, and falls into the Atlantic by the Bay of Winyaw; total course, 360 miles, of which 200 miles are navigable for boats of 60 or 70 tons. Little Pedee rises in North Carolina, and enters the Great Pedee 32 miles above its embouchure.

PEDESTAL, an insulated basement or support for a column, a statue, or a vase. It usually consists of a base, a die or dado, and a cornice, called also a *surbase* or *cap*. When a range of columns is supported on a continuous pedestal the latter is called a *podium* or *stylobate*.

PEDICELLARIÆ, the name applied to certain minute organisms or structures found attached to the skin or outer surface of star-fishes, sea-urchins, and other Echinodermata. Each pedicellaria consists essentially of a stalk attached to the organism, and bearing at its free extremity two or more movable blades or jaws, which close and open on foreign particles so as to retain them. The exact homology of these structures is still a matter of doubt. Some naturalists have maintained that they represent spines peculiarly modified from those which generally cover the bodies of Echinodermata. Others have regarded them as merely parasitic organisms. Their movements continue after the death of the animal to which they are attached; but it is not known whether their vitality is thus entirely distinct, or whether it is merely prolonged after the death of the host, as in certain tissues and parts of the higher animals. Their function has been alleged to be chiefly that of attracting and seizing particles of food, or of getting rid of effete matters by seizing such and passing them onwards to the outer medium.

PEDICULUS. See LOUSE.

PEDIGREE. See GENEALOGY.

PEDIMENT, in classic architecture, the triangular finishing above the entablature at the end of buildings or over porticoes. The mouldings of the entablature bound the inclined sides of the pediment. The triangular finishings over doors and windows are also called pediments. In the debased Roman style the same name is given to these same parts, though not triangular in their form, but circular, elliptical, or interrupted. In the architecture of the middle ages small gables and triangular decorations over openings, niches, &c., are called pediments.

PEDLARS and HAWKERS are itinerant dealers who carry their goods from place to place for sale. The opportunities which the want of a fixed domicile or place of business gives to itinerant dealers of evading responsibility for their transactions, and practising fraud with impunity, have in the judgment of the legislature made it necessary to place this trade under special supervision, and this has been done from time to time by various statutes, which were repealed by 52 Geo. III. cap. cviii., which defined a hawker, regulated the trade, and imposed a license duty on the persons conducting it. The trade is now regulated by the act 34 and 35 Vict. cap. xcvi. Certificates are given by the chief officer of police of the district for which they are asked, to persons of good character, who must satisfy the officer they are seventeen years of age, have resided for one month in the district, and intend to carry on the business of a pedlar in good faith. The certificated pedlar is to be deemed a licensed hawker for the purposes of the Markets and Fairs Clauses Act. The certificate is not to cost more than five shillings, and to be in force for a year. It may be extended to other police districts by endorsement of the chief of police, at a charge not exceeding sixpence for each endorsement. A register of certificates is to be kept in each district. No certificate is to be granted to any person convicted of felony, or of a misdemeanour involving dishonesty. An appeal against refusal of certificate may be made to any court by which a penalty for infringement of the act can be enforced. Penalty for acting without a certificate, 10*s.* for the first offence and £1 for every subsequent offence; penalty for assigning or borrowing a certificate, £1; for forging a certificate, £2 for the first offence, and imprisonment for a period not exceeding six months, with or without hard labour, for every subsequent offence. A single act of selling is not sufficient to constitute a pedlar. Commercial travellers, or other persons selling or seeking orders for goods, wares, or merchandise to or from persons who are dealers therein, and who buy to sell again, or selling or seeking orders for books as agents authorized in writing by the publishers of such books, sellers of fish, fruit, or victuals, and persons selling or exposing to sale any goods, wares, or merchandise in any public market or fair legally established, are not to be deemed pedlars. Hawkers' licenses for dealers who use beasts of burden are granted by the excise. They cost £4 per annum for each beast, and include the right to sell tea and coffee, but not spirits.

PEDOMETER, or HODOMETER, is an instrument like a watch, which serves to indicate the distance a pedestrian traveller has gone, or rather the number of paces he has made; the instrument being so constructed that it moves with the motion of the wearer, the indicator advancing one degree for each step he makes.

PEEBLES, PEEBLESSHIRE, or TWEEDDALE, an inland county in Scotland; bounded on the south by Dumfries, on the south-east by Selkirk, on the north and north-west by Edinburgh, and west by Lanark; area, 226,899 acres. The total acreage under crops of all kinds in 1883 was 42,433, of which 9832 were under corn, 5716 under green crops, 12,078 under clover and grasses in rotation, and 14,763, under permanent pasture. The number of cattle in 1883 was 5664; sheep, 192,122; agricultural horses, 912. The greater part of the surface consists of mountain, moor, and bog; the first prevailing to such an extent as to render the general elevation greater than that of any other county in the south of Scotland, the highest summits varying from 2400 feet to above 2800 feet. This portion of the county contains much wild and striking scenery. The prevailing rock is whinstone, much of it of excellent quality, but a great part of it of so laminated a structure as to be unfit for building. White and red freestone are common in the northern part of the county, and both coal and limestone have been long wrought at various points. The Tweed is the only river in Peeblesshire of any note, but there are numerous rivulets, tributaries of the Tweed. Most of these abound in salmon and trout. The county, in conjunction with Selkirk, returns a member to Parliament; principal town, Peebles. Pop. (1871), 12,330; (1881), 13,822.

PEEBLES, a royal burgh and market town, capital of the above county, 20 miles south of Edinburgh, on a slightly elevated tongue of land formed by the junction of the Eddleston Water with the Tweed. Its houses are generally of whinstone, two stories in height, and well built. It has a county-hall in the Elizabethan style erected in 1844; a town-hall, several churches, including the parish church and

Episcopal and Roman Catholic chapels; a grammar and several other schools, and an institution (the Chambers' Institution) presented to the town in 1859 by Dr. W. Chambers, the well-known publisher, and comprising a reading-room, a public library of 20,000 volumes, a museum, a gallery of art, and a hall for lectures and concerts. There are two woollen factories and a spinning-mill, but the inhabitants are mainly employed in agriculture. Pop. (1881), 4059.

PEECHE. See DAUW.

PEEL, a seaport town on the west coast of the Isle of Man, rising into some note as a health resort and a fishing station. Here are the ruins of an ancient cathedral and castle, two churches, and other places of worship, several schools, &c. There are a foundry, three large net manufactories, engineering, boat-building, manure, chemical and other works. The harbour is being improved at considerable cost. Pop. (1881), 3829.

PEEL, SIR ROBERT, a celebrated British statesman, was born 5th February, 1788, near Bury in Lancashire. His father, who had raised himself from a comparatively humble station to be the largest cotton manufacturer in the world (his works employing 15,000 hands), was created a baronet in 1800, and left behind him a fortune of nearly £2,000,000, of which the largest share was inherited by his eldest son Robert. Young Peel, after careful instruction at home, was sent to Harrow, and in his sixteenth year proceeded to Oxford, where he took his bachelor's degree in 1808, with the rare honour of a double first. Immediately on attaining majority he was elected member of Parliament for Cashel, and took his place as a supporter of the Perceval ministry. In 1810 he seconded the address, and gave such high hopes of parliamentary success that in the course of the same year he became under-secretary of state for the colonies. On the assassination of Mr. Perceval in 1812 a new ministry was formed under Lords Liverpool and Castlereagh, in which Peel became chief secretary for Ireland. In the new Parliament of the same year he became member for Chippenham, and by his zealous defence of Protestantism in Ireland subjected himself to the abuse of O'Connell, which so exasperated him that he had the indiscretion to send him a challenge. Among the fruits of his six years of Irish administration may be mentioned the establishment of the constabulary force. In 1817, on a vacancy in the representation of the University of Oxford, he was unanimously elected to supply it. The following year he resigned his office in the ministry, of which he still continued to be a supporter, and began to take a leading part in the discussion of the difficult financial questions then pending. In 1819 he was chairman of the Bank Committee, which recommended the resumption of cash payments on Ricardo's scheme. He opposed parliamentary reform, and supported the repressive policy of the ministry. In 1820 he married Julia, youngest daughter of General Sir John Floyd. In 1822 he rejoined the Liverpool ministry as home secretary, and continued in this office till the dissolution of the ministry. During this period his greatest measure was the reform of the criminal code. On the death of Castlereagh (1822) Canning and Peel became the leading members of the ministry. They differed on several points, Canning being generally more liberal than Peel, who with Lord Eldon was considered the head of the old Tory party; and when, on the retirement of Lord Liverpool (1827), Canning formed a ministry in which Catholic emancipation was an open question, Peel declined to join him. The Canning administration broke up in January, 1828, a few months after the death of the premier, and a new ministry was formed, in which Wellington and Peel were the leaders—the former as first lord of the treasury, the latter as home secretary. The principal act of this ministry was the passing of the Roman Catholic relief bill, which cost Peel his seat for Oxford. He also passed the New Metropolitan Police Act, which gave rise to the new nicknames Bobbies and Peelers for the London police, who were previously called Charlies. In 1830 he succeeded his father as baronet. At the close of this year the ministry resigned in consequence of the increasing agitation for parliamentary reform, and were succeeded by the reform ministry of Earl Grey. Peel opposed the reform bill vigorously in the House of Commons; but when the Duke of Wellington offered to throw it out in the House of Lords if Peel would join him in forming a ministry, he wisely, perhaps, declined, and the bill passed into law, 26th June, 1830. As soon as the act was passed he declared his intention frankly to accept it, and began vigorously to prepare his party for the change in its circumstances. In this he showed great breadth and statesmanship. The only thing he appears to have forgotten was himself. The disposition to yield to the force of circumstances and to admit new convictions, however valuable in itself, is a dangerous qualification in the head of a party, who is supposed to think not only for himself but for his followers, and whose opinions should consequently be formed well in advance. This seems to have been the great vice in Peel's career, and however valuable the reforms which he promoted, the ruin of the party which trusted him, as the price of their promotion, can hardly be excused on any high ground of political morality. His first step after the reform bill was to change the name of the party from Tory to Conservative—a change intended to indicate a more comprehensive principle, and which tended to rally round him all who were alarmed at the real dangers of a too rapid progress in a democratic direction. He next proclaimed his celebrated watchword to his party, 'Register, Register, Register,' which was so well obeyed as nearly to give him a majority in the second election after the reform bill. In the election of 1832 he was returned for Tamworth, for which he continued to sit during the remainder of his life. He was in a decided minority in the first reformed parliament, but the prudence of his opposition served greatly to increase his influence, and at the close of 1834, while he was absent in Rome, the king suddenly dismissed the Whigs, and called in the Duke of Wellington, who transferred the premiership to Peel, taking for himself the foreign office. A dissolution of Parliament now took place, which increased the number of supporters of the new ministry in the House of Commons, but did not give them a majority. After a brief struggle the ministry resigned, and were succeeded by the Whig ministry of Lord Melbourne, which lasted from 1835 to 1841. The opposition of the extreme reformers, and especially of the Corn Law League on the one hand, and that of the Conservative party on the other, gradually weakened this ministry, and in 1839 they retired; but the refusal of the queen to accept the changes in her household which Peel deemed necessary prevented his assumption of office, and the Whig ministers were recalled. The general election of 1841 gave a large majority to Sir Robert Peel, and the formation of a Conservative ministry could no longer be delayed. In the session of 1842 the most important measures were the sliding-scale, by which a considerable reduction was made on the duties on the importation of corn (see CORN-LAWS); the imposition of an income-tax for three years, but which with various alterations has continued to be levied to the present time (see INCOME-TAX); and a

lordship—the borough of Arundel—which confers the dignity of earl on its possessor by prescription. In regard to all other titles the peerage is personal, and descends in a direct line from male to male. The chief privileges of peers are that of a seat in the House of Lords, of a trial by persons of noble birth in case of indictments for treason and felony, and misprision thereof, and of exemption from arrest in civil cases. Peers created for life, by a decision of a committee of privilege of the House of Lords in 1856, are not allowed to sit in the House of Lords. For further information regarding the peerage see articles BRITAIN (division Constitution) and PARLIAMENT.

PEGASUS, in Greek mythology, a winged horse, the offspring of Poseidon and Medusa, which sprang from the body of the latter when Perseus struck off her head. He was called Pegasus because he was supposed to have made his appearance near the sources (*pēgai*) of the ocean. According to the earliest accounts he rose to the celestial abodes, and carried thunder and lightning for Zeus. According to others he was placed among the stars. It is further told that Bellerophon made use of Pegasus in his fight with the Chimæra; when he had conquered the Chimæra he endeavoured to rise on the winged horse to heaven, but fell to the earth, according to some, because Zeus sent a gad-fly to sting Pegasus, which threw him. With the stroke of his hoof he called forth the sacred well Hippocrene, on Mount Helicon, from which he was in later times called the horse of the muses.

PEGU, now a division of British Burmah, but previous to 1757 a powerful and independent kingdom, and from that period up to 1853 a province of the Burmese Empire, from which in the last-mentioned year it was severed and annexed to the British dominions. It lies between lat. 15° 45′ and 19° 30′ N., and extends east and west from the Saluen to the Bay of Bengal, thus comprising the whole delta of the Irrawady. It is traversed by several ranges of mountains, but generally speaking may be considered a level country. The soil is naturally very fertile, but cultivation was almost entirely neglected after the conquest of the country by the Burmese, although previous to that event the natives of Pegu were industrious and skilful agriculturists. Agriculture, however, is recovering under British rule. The mineral kingdom comprises iron, tin, and lead; rubies, sapphires, and rock-crystals are also met with. Besides the numerous branches of the Irrawady which overspread, like a piece of net-work, the whole south-west surface of the country, another large river called the Setang waters the east portion, and falls into the Gulf of Martaban. The Saluen, as already mentioned, forms its eastern boundary. Amongst the natural productions of the country is teak timber. The principal object of cultivation is rice, which is raised with little trouble. Tigers, elephants, buffaloes, deer, and other animals abound in the woods, and in the extensive tracts which have been left to be overrun with jungle. The principal ports of Pegu are Bassein and Rangoon. The inhabitants are called by the Burmese *Taleins* or *Talings*, and by themselves *Moons*. In consequence of the outbreak of hostilities in 1852 between Burmah and the British government, the province of Pegu was rapidly conquered, and occupied by the troops of the latter, and in 1853 its annexation to the British territories in the East was formally declared. Area, 25,964 square miles. Pop. in 1881, 2,323,512.

PEGU, an ancient city, and capital of the foregoing province, on the left bank of the Pegu River, about 70 miles north from Rangoon. It was formerly a place of great importance, forming a quadrangle, each side of which measured 1½ mile in length, and containing a pop. of 150,000. It was destroyed in 1757 by the Burmese, and the new town has been built on the site of the old. Pegu was captured by the British in 1824, and restored at the termination of hostilities. It was also stormed and taken by them during the second war in 1852. The pop. is now only about 4000.

PEHLVI, or PEHLEVI. See PERSIA—Language.

PEI-HO, or NORTH RIVER, a river in China, in the province of Pechelee, rises near the great wall, flows south-east and joins the Eu-ho and Hoen-ho, 70 miles south-east of Peking, and 30 miles above the mouth of the united stream in the Gulf of Pechelee. It is navigable for boats to within 20 miles of Peking. At its mouth is the small town of Taku with several forts, which acquired some note in the war with the British and French in 1860.

PEINE FORTE ET DURE, a punishment formerly inflicted upon a prisoner charged with felony if he refused to answer on his indictment. In an indictment for high treason a prisoner who was obstinately mute was liable to receive judgment and execution the same as if he had been convicted. In the lowest felony, or petty larceny, standing mute was also held equivalent to conviction, and the prisoner received sentence and punishment accordingly. But in all other felonies the prisoner was required to plead before a conviction could be obtained, hence if he refused he was subjected to the *peine forte et dure*, 'a judgment which was purposely ordained to be exquisitely severe, that by that very means it might rarely be put in execution.' Before this sentence was pronounced the prisoner had not only *trina admonitio* (threefold admonition), but also a respite of a few hours, and the sentence was distinctly read to him, that he might know his danger; and after all, if he continued obstinate, and his offence was clergyable, he had the benefit of his clergy allowed, even though he was too stubborn to pray for it. 'Thus tender was the law of inflicting this dreadful punishment;' but if no other means could prevail, and the prisoner, when charged with a capital felony, continued stubbornly mute, the judgment was then given against him without any distinction of sex or degree. The judgment for standing mute was as follows: that the prisoner be remanded to the prison from whence he came, and put into a low, dark chamber, and there be laid on his back on the bare floor, naked, unless where decency forbids; that there be placed upon his body as great a weight of iron as he can bear; and more, that he have no sustenance, save only, on the first day, three morsels of the worst bread; and on the second day three draughts of standing water, that should be nearest to the prison door; and in this situation this should be alternately his daily diet till he answers. This penalty has been traced by some authorities to a statute of Edward I., before which it is supposed not to have been inflicted. The penalty was abolished by Act 12 George III. cap. xx. There are various cases recorded of persons, including at least one female, who have died under the infliction of this penalty. See Tomlins's Law Dictionary, article Mute.

PEIPUS, or TCHONDSKOE-OZERO, a lake of Russia, between the governments of St. Petersburg, Revel, and Livonia; greatest length, 55 miles; breadth, 30 miles. The depth is considerable, and has floated 24-gun frigates. It receives the Embach and Kosa on the south-west, the Tcherma on the east, and the Jettcha on the south-east; and discharges itself on the north-east by the Narova into the Gulf of Finland. It is well supplied with fish. In 1702 a naval engagement took place on the lake between the Swedes and Russians. The latter had the advantage.

PEISHWA, or PESHWA, the prime minister and subsequently the head of the Mahratta Empire or Confederacy. See MAHRATTAS.

PEKING, or PEKIN (*Pe*, north; *King*, court), the capital of the Chinese Empire, in the province of Pechelee, on an extensive, barren, sandy plain, between the rivers Pei-Ho and Hoen-Ho; lat. 39° 54′ 13″ N.; lon. 116° 27′ E. It is about 40 miles from the great wall, and 100 miles from the Gulf of Pechelee. The appearance of this vast city in approaching it is by no means impressive, little or nothing of the buildings inside the walls being seen. The entire circuit of the walls and suburbs of Peking is reckoned at 25 miles. The wall is 30 feet high, and 25 feet thick at the base, diminishing to 12 feet at the top. It is faced nearly throughout with large bricks, laid in a mortar of lime and clay, which, in time, becomes almost as durable as stone. Square towers, projecting 50 feet from the outer side of the walls, occur at intervals of about 60 yards, and the whole is surrounded by a ditch. There are in all sixteen gates leading into the city.

The present city of Peking consists of two portions, the north or Tartar city, called Nui-Ching; and the south, called Wai-Ching. The former is built in the shape of a parallelogram, facing the four quarters of the globe, and consists of three inclosures, one within the other, each surrounded by its own wall. The innermost inclosure or area is called Kin-Ching (prohibited or forbidden city), and contains the imperial palace, and buildings connected with it, in which the emperor and royal family reside. It is about 2 miles in circumference, is surrounded by a solid wall faced with glazed bricks, and covered with yellow tiles. The second inclosure is of an oblong shape, about 6 miles in circuit, surrounded by a wall about 20 feet high. It was originally intended for the officers of the court, but is now occupied by Chinese merchants and tradesmen. The third inclosure comprises the open city, which presents all the evidences of an industrious people, intent on the pursuit of gain, mercantile bustle pervading every corner of it. Many of the principal streets of Peking are spacious, being more than 100 feet wide, but they are unpaved, and in rainy weather impassable from mud. Amongst the principal public buildings of Peking, besides those already mentioned, are the Temple of Eternal Peace, belonging to the lamas, and said to be the largest and most splendid temple in Peking; the Mohammedan mosque; the observatory; the church of Heaven's Lord, with a convent attached to it, considered one of the finest specimens of architecture in the city, but now going to decay. There are also religious edifices, appropriated to many forms of religion, the principle of toleration being here carried to the utmost extremity—amongst these are the Greek and Latin churches, Moslem mosques, Buddhist temples, besides temples dedicated to Confucius and other deified mortals. Among the more laudable institutions of Peking is the national college, Han-lin-yuen, where all Chinese learning and literature are concentrated, also Manchoo, Chinese, and Russian; all religions, though some of them are proscribed, share the honour of being sanctioned within its precincts. The other learned and scientific institutions of note are the medical college, astronomical board, and the imperial observatory. Peking is sustained solely by its being the seat of government, having no trade except that which is produced by the wants of its vast population. There are no manufactories of any importance, beyond those necessary for making articles of luxury for the resident aristocracy and gentry, consequently it is not famous for its skilled workmen and artisans. The principal part of the provisions required comes from the southern provinces, or from the flocks reared in the northern part of Pechelee, the adjacent plain producing but a small amount of the food demanded. A considerable portion of the taxes levied upon the productions of the whole empire is paid in kind, and is here stored up; the amount of rice alone in these granaries at one time of the year is enormous; but they are often empty before the new crop is gathered, so that a great many die for want of food. The large establishment of the emperor, and the numerous persons in the employment of the government, who are paid out of the public revenue, absorb a great portion of the grain.

According to the terms of the Treaty of Tien-tsin (1858) English and French ministers are allowed to reside at the Chinese capital, and subsequently the same privilege was granted to America and some other nations. Foreigners generally are also allowed to visit the city, but they must be provided with a passport from the ambassador or consul of the nation to which they belong, and on no account is any individual allowed to carry on trade. Previous to the ratification of that treaty Russia was the only foreign power privileged to have a resident embassy. There are six religious missions—four British, one American, and one Russian. Of the native population a more correct estimate has been obtained since our countrymen have had free intercourse with the inhabitants; at the same time it is only approximate, in the absence of a native census. In 1861 the Tartar section of the city was calculated to contain 800,000 civilians and 110,000 soldiers, of the Tartar Banner corps; and the Chinese section about 400,000 persons; making a total, in round numbers, of 1,310,000. Later estimates have varied between 1,000,000 and 1,500,000. The Pekingese have more of the Tartar element among them than the inhabitants of any of the more southern cities of China; still the Chinese predominate, and they are gradually superseding their fellow-subjects by their greater industry and wealth. Even the old Tartar Banner corps is being dispersed.

As a place of residence for Europeans Peking is by no means so unhealthy as the more southern cities, although the range of temperature is much greater. This arises from the comparative dryness of the site, so that, although the thermometer falls to 10° below zero in the winter, and rises to 110° in the shade in summer, less inconvenience is felt than in Shanghai, where intense humidity prevails at a lesser range. A rude system of drainage intersects the city, but not sufficient to carry off the effluvia of the sewage, which even pervades the dust in summer, exhaling a disagreeable odour. The water supply is abundant, and a very complete fire brigade uses it to advantage in quenching the frequent conflagrations that take place. These and other matters are under the management of a governor of the city, irrespective of the central administration, which holds its offices in the imperial quarter of the Tartar section.

Peking is regarded by the Chinese as one of their most ancient cities, but it was not made the capital of the country until its conquest by the Mongols about 1282. In the war of 1860 Peking was occupied by the allies on 12th October, and evacuated by them, after the signing of a convention, on 5th November. To revenge a treacherous massacre of prisoners taken under a flag of truce they pillaged and destroyed the emperor's summer palace of Yuen-ming-yuen, 4 miles north-west of the city, taking booty to the value of £1,500,000, and destroying property to a larger extent.

PELAGIANISM, the doctrine of original sin taught by Pelagius, and condemned by several councils of the church. Pelagius was a British monk of

the latter end of the fourth and beginning of the fifth century, of whose life little is known except in connection with the controversies evoked by his doctrine. His name is said originally to have been Morgan, which was Latinized into Marigena (sea-born), and rendered into Greek by Pelagius (from *pelagos*, sea). Pelagius was in Rome about the year 400. He is said to have learned there the opinions afterwards identified with his name from a monk Ruffinus, whose teaching was founded on that of Origen. The promulgation of his views by Pelagius was nearly simultaneous with that of the orthodox theory by Augustine, and in the development of his doctrine Augustine was influenced by his opposition to Pelagianism. Previous to this time the doctrine of original sin had not been logically developed, and there appears to have been some difference between the Eastern and Western Churches regarding it. The Eastern divines held that the fall did not derogate from the entire freedom of the human will, which they considered inseparable from responsibility. They held that the image of God in man was defaced, not lost, by the fall, and that the power of doing good and resisting evil remained intact. This was the doctrine of Origen. The Latin divines, on the other hand, and particularly Tertullian, appear to have maintained the doctrine of human corruption in the more unqualified form, which received its full development from Augustine. Among the early supporters of Pelagius were Coelestius, a Roman advocate, who afterwards became a monk; and Julian, bishop of Eclanum, in Campania. The Pelagians generally affirmed that Adam was born subject to death (though Pelagius himself withdrew this doctrine at the Council of Diospolis); that every child was born in the same state of innocence as Adam was, and that his perseverance in virtue depended upon himself. Pelagius held, on metaphysical grounds, that original sin was an impossibility. Sin, he said, was the result of a depraved volition, not an infirmity of nature, and could not be propagated. A *peccatum naturale*, as he called it, was a confusion of terms, and a contradiction. Pelagius, however, seems to have been less open and straightforward in maintaining his views against opposition than his disciple Coelestius, whom he attempted to abandon when they were exposed to condemnation for heresy. Coelestius and Pelagius left Rome in 409, the former going to Carthage, the latter to Jerusalem.

Between A.D. 412 and 431 twenty-four councils were held in regard to their doctrine. Coelestius was condemned by the Council of Carthage in 412. He refused to submit, and went to Ephesus, where he was made a presbyter. Pelagianism was again condemned in the provincial council of Carthage in 416, and an account of the proceedings sent to the pope. Pope Innocent I. had just died, and Coelestius, who had gone to Rome to defend his doctrine, at first found a supporter in Zosimus, the new pontiff, who acquitted both him and Pelagius, and severely censured their accusers. But the Council of Carthage in 417 and 418 repeated its condemnation, and the Emperor Honorius issued a rescript against the Pelagian doctrines. The pope then abandoned his protégés, confirmed the sentence of the councils, and anathematized the Pelagians. Pelagius was expelled from Jerusalem in consequence of this sentence, and of a condemnation by a synod held at Antioch in 421. Nothing is known of his subsequent career.

A doctrine subsequently distinguished as semi-pelagianism was taught by John Cassian, a monk of Constantinople, ordained a deacon by Chrysostom in 403. He acknowledged the universal deterioration of human nature by the fall. The warfare between the flesh and the spirit, which he represents as a discipline and not an unmitigated evil, then began. He did not hold the will of man, though free, sufficient to lead him in the paths of virtue; but he held that the grace of God was manifested in working with man, delivering him from evil and giving him the mastery of his passions. It is impossible, he says, to affirm whether in conversion the grace of God or the will of man has the precedence. For a further history of the doctrine, see ORIGINAL SIN.

PELARGONIUM. See GERANIUM.

PELASGIANS, a name frequently occurring in ancient historians, and supposed by some authorities to represent a race which in prehistoric times was spread more or less extensively over Greece, Asia Minor, and Italy. Everything about the Pelasgians is doubtful. It has even been suggested that the name does not represent a distinct race, but is merely an epithet, like *autochthones* or *aborigines*. This would at all events explain some of the difficulties in regard to the Pelasgi, as their wide diffusion and uniform disappearance before other races.

The Pelasgi are mentioned by Homer, who speaks of them as dwelling in Argos and in Epirus; by Hesiod, who mentions Dodona as their seat. Herodotus also found traces of them at Dodona, where he says they worshipped all the gods without giving a name to any. Strabo speaks of them as an ancient tribe spread over the whole of Hellas. There are also accounts of their inhabiting Bœotia and Attica. Herodotus, contrary to the usual accounts, speaks of their stationary habits. Various accounts are given of their expulsion from Athens. Thucydides refers to the name Pelasgic as having been common among the Greek tribes before the use of the term Hellenic. Herodotus also says the name was thus applied among the Athenians. They are mentioned by various writers from Homer downwards as inhabiting various islands of the Ægean. Herodotus mentions seventeen islands on the coast of Asia as belonging to them. He also speaks of them as inhabiting in his time the cities of Scylace and Placie on the Propontis, and speaking a language different from the Greek.

When we come to Italy we find accounts equally vague and difficult to reconcile. They are frequently supposed here to have been a widely diffused nation, who gave to the Latin language, as the ancestors of the race by whom it was originally spoken, the element it had in common with the Greek, but when the evidences of their diffusion are investigated they prove to be of the most illusory kind.

In regard to the language of the Pelasgians there are two opposed theories. Bishop Thirlwall interprets the reference of Herodotus to it as signifying that they spoke a language differing from Greek as two remote but cognate branches of the same stock. Grote holds that Herodotus meant that the language they spoke was not Greek at all.

The views of modern critics on the general question are as various as the materials on which they are founded. Niebuhr regarded the migrations of the Pelasgians as mythical, while he held that the people themselves were a great and widely-spread people, inhabiting all the countries from the Po to the Bosporus, and supplying a common foundation to the Greek and Latin languages. The supposed Pelasgian migrations are, he believed, only the scattered fragments of this once united people, whose greatness he places in pre-historic times. Other writers, such as Grote, receive the entire tradition of the Pelasgians with almost complete scepticism. The universal diffusion of the Pelasgi, their entire disappearance, and the confusion caused by apparent re-appearances appear to them inexplicable on any hypothesis. They consequently regard them as purely legendary.

Various monuments have been attributed to the

Pelasgi both in Greece and in Italy, but in regard to these there is the same sort of uncertainty as in regard to the people themselves. Are they the monuments of a single people or of different peoples? The remains attributed to the Pelasgi are found in Italy, Greece, and Asia Minor, and their diffusion hardly accords with the notion of their being the works of a single people, so as to form an independent testimony to the otherwise doubtful existence of a race by whom they might have been executed. These remains belong to the style of architecture called Cyclopean. See CYCLOPEAN WORKS.

PELEUS, in Greek mythology, son of Æacus, king of Ægina, and Endeis. Having taken part in the murder of his half-brother Phocus, he fled with his brother Telamon to Phthia to the court of Eurytion, the son of Actor, who purified him from the murder, and gave him his daughter Antigone in marriage, with a third part of his kingdom. Antigone, according to some authorities, was the mother of Achilles. Peleus now went with Eurytion to Calydon, to aid in hunting the celebrated boar. On this expedition he accidentally killed his father-in-law with a javelin which he aimed at the boar. Upon this he fled to Iolcus to Acastus, who purified him from the deed. Astydamia, the wife of Acastus, became enamoured of him, and because Peleus refused to gratify her desires, she accused him of a criminal passion for her, and thus endeavoured to make him an object of hatred to her husband and to his own wife. Antigone hung herself in despair; but Acastus, unwilling to violate the laws of hospitality, selected a hunting party to go to Mount Pelion, with the intention of having Peleus put to death. Overcome with fatigue he fell asleep on the mountain, and Acastus caused his sword to be taken from him, and then bound him that he might become the prey of wild beasts. But when he awoke, Chiron, his mother's father, brought him back his sword. He then invaded Iolcus with Jason, the Dioscuri, and a band of brave warriors, put Acastus to flight, and the queen to death. This is placed by some after his marriage with Thetis. Thus he became master of a part of Thessaly. The gods rewarded his continence by giving him, at the suggestion of Themis, the nymph Thetis for a wife, of whom he obtained possession by the assistance of Chiron. The nuptials were celebrated on Mount Pelion, and honoured with the presence of all the gods, who brought rich bridal presents. Poseidon gave Peleus the immortal horses, and Chiron the strong spear, which afterwards served Achilles before the walls of Troy. Many ancient poets celebrated these nuptials, of whose songs only an echo remains to us in the Epithalamium of Catullus. Some later poet connected with this marriage the fate of Troy. (See ERIS.) Peleus, who in his youth had been present on the Argonautic expedition, now ruled the Myrmidons in Phthia. Homer calls him an eloquent, and powerful, and wise man. Of all the children of Peleus and Thetis, Achilles only reached the age of manhood. According to writers later than Homer Thetis destroyed six of her children by holding them over a fire to destroy their mortal parts, and would have done the same with Achilles had not Peleus prevented her. Peleus educated him with Patroclus, who had fled to him for safety, and reluctantly suffered him to go to the siege of Troy. Thetis deserted him, and he had the grief to survive his beloved son. After his death he received divine honours, together with Chiron, from the inhabitants of Pella, in Macedonia; and Pindar mentions him as one of the judges in the infernal regions.

PELEW ISLANDS, a group at the western extremity of the Caroline group, North Pacific Ocean; lat. 8° to 9° N.; lon. 130° to 136° E. They are about twenty in number, extend nearly N.N.E. and S.S.W., 87 miles, and are completely encircled by reefs. The largest island is Baubelthouap, forming the north-east part of the chain, 24 miles long, with a high hill on its west side. Most of the other islands are rather low, but cultivated. The inhabitants are a tribe of Malays. They wear no clothes. Their huts are very simple, but they show some ingenuity in the construction of their boats. The crew of the British ship *Antelope*, which was wrecked here in 1783, were treated by the islanders with great kindness, but latterly they have shown a hostile spirit to the whites, and the crews of several vessels have been nearly cut off when touching at these islands.

PELIAS, in Greek mythology, son of Poseidon by Tyro, the daughter of Salmoneus, and king of Iolcus, in Thessaly, from the throne of which he drove its lawful possessor, his step-brother Æson. He also removed Jason, son of Æson, on pretence of sending him to Colchis for the golden fleece. On the return of Jason, Pelias' own daughters, following the advice of the cunning Medea, who promised to renew his youth by her magical power, killed him, and boiled his dismembered remains in a cauldron: some say that Medea killed him herself. His son and successor, Acastus, instituted splendid games in honour of the dead, in which some of the most celebrated Argonauts bore off the prizes.

PELICAN, a genus of Natatorial or Swimming Birds, inhabiting both Old and New Worlds, and forming typical examples of the family Pelecanidæ. This family belongs to the *Totipalmate* division of the Natatores, the hinder toe being directed inwards and united to the front toes by the web or membrane. The wings are powerful, and the feet, which are placed in the middle of the body, are of short conformation. The head is small. The bill is much elongated, provided with a sharp ridge or keel, the upper mandible terminating in a distinct hook or *unguis*. The lower mandible is composed of two flexible rami or halves, which are united at the tip only. The skin or integument between the halves of the lower jaw is greatly developed, and modified to form a large *gular* pouch, in which the fishes on which these birds feed may be stored, the young being fed by the parents out of the pouch. This pouch is capable of holding as much as 20 pints of fluid. The skin of the pouch is unfeathered, and the face is also naked. The nostrils exist at the base of the bill in the form of narrow slits. These birds fly and swim well. They subsist on fishes, which they catch by darting down into the water from a height of 20 or 30 feet. They may perch upon trees; and inhabit the banks of lakes and rivers and the sea-coasts. They are generally gregarious in habits. The Pelicans are all of considerable size, averaging about 4 or 5 feet in length, and measuring from 10 to 13 feet in expanse of wing. The nest is of rough construction, and usually placed close to the sea or water. The young remain in the nest until they are able to fly. When harassed or pursued the contents of the pouch and stomach may be rejected. The two sexes closely resemble each other.

The Common or White Pelican (*Pelecanus onocrotalus*) is coloured a delicate white, tinged with rose or pink. The primary quill feathers are black, the upper mandible being coloured blue, with yellow and red hues. The hook or *unguis* terminating the bill is bright red in colour, the pouch being coloured yellow. The stretch of wing averages about 11 feet, and the body measures 4 or 5 feet. The eggs number two or three, and are white in colour. The young are coloured of a cinereous hue, this difference of hue inducing the mistake of regarding the younger birds as distinct species (*P. Phillippensis* and *P. fuscus* of

Gmelin and Latham). The young birds are fed by the parents with fishes from the pouch, and the males are said to feed the incubating females in a similar manner. When thus engaged in feeding the young the bright red tip of the bill and the pouch are pressed against the breast to press out the prey, this act giving rise to the supposition of the ancients that the parent pelicans fed their young with their blood. This bird has its specific name from its cry, which is loudest during flight, and which the ancients compared to the braying of an ass. It inhabits Asia, Africa, and South America. About the middle of September flocks of this species repair to Egypt in regular bands. During the summer months they take up their abode on the borders of the Black Sea and the shores of Greece. They are rare in France and unknown in Great Britain. In fishing they do not immediately swallow their prey, but fill their bag, and return to the shore to consume at leisure the fruits of their industry. As, however, they quickly digest their food, they generally fish more than once in the course of the day, and for the most part in the morning and evening, when the fish are most in motion. A single pelican will, at one repast, despatch as many fish as would suffice for six men; and in confinement it will, moreover, snap up rats and other small quadrupeds. At night it retires a little way on the shore to rest, with its head leaning against its breast, and in this attitude it remains almost motionless till hunger calls it to break off its repose. It then flies from its resting-place, and, raising itself 30 or 40 feet above the surface of the sea, turns its head, with one eye downwards, and continues on wing till it sees a fish sufficiently near the surface, when it darts down with astonishing swiftness, seizes it with unerring certainty, and stores it up in its pouch; it then rises again, and continues the same manœuvres till it has procured a competent stock. The female feeds her young with fish that have been macerated for some time in her pouch. The pelican is not only susceptible of domestication, but may even be trained to fish for its master. When a number of pelicans and cormorants get together they are said to practise a singular method of taking fish; for they spread into a large circle, at some distance from land, the pelicans flapping on the surface of the water with their extensive wings, and the cormorants diving beneath, till the fish contained within the circle are driven before them towards the land; and as the circle contracts by the birds drawing closer together, the fish are at length reduced within a narrow compass, when their pursuers find no difficulty in securing them. In this exercise they are often attended by various species of gulls, which participate in the spoil. The flesh of the pelican is said to be coarse and unsavoury. (See Pl. CL.–CLI. fig. 22, and Pl. CLII.–CLIII. fig. 1.)

PELION (now *Sagari*), a high mountain, Thessaly, producing various medicinal herbs. On one of its summits stood a temple of Zeus. In the neighbourhood we find the grotto of the centaur Chiron. In the war of the Titans with the gods the former, say the poets, piled Ossa upon Pelion to aid them in climbing to Olympus. This conception is said to have been suggested by the conical form of Ossa and the flat summit of Pelion.

PELISSIER, Aimable Jean Jacques, Duc de Malakoff, marshal of France, was born at Maromme, Seine-Inférieure, 6th November, 1794. He belonged to a family of well-to-do peasants. He was educated at the school of St. Cyr, and in 1815 was incorporated as sub-lieutenant of artillery in the Royal Guard. On his regiment being disbanded in the same year he entered the departmental legion of the Seine-Inférieure. In 1819 he passed successfully an examination in practical military knowledge, in consequence of which he was attached to the staff. He was made a lieutenant in 1820; and in 1823 he served in the expeditionary campaign in Spain as aide-de-camp of General Grundler, and subsequently of other generals. In 1827 he was promoted to a captaincy in the Royal Guard, and accompanied General Durrieu to the Morea as aide-de-camp, where, in 1828–29, he fought against the Turks. On his return he served in the expedition to Algiers. After being attached for some time to the war-depôt, he was sent to the army of observation on the Meuse. He was on duty in Paris from 1834 to 1837. In 1839 he became lieutenant-colonel and was sent to Algiers. At the head of the staff of the province of Oran he distinguished himself in the expedition against Tagdempt in 1841; was promoted to a colonelcy in 1842. He commanded the left wing at the battle of Isly (14th August, 1844), where he particularly attracted the notice of Marshal Bugeaud. In 1845 he suffocated in a cave at Ouled Rhia a party of Arabs who had taken refuge in it, by lighting a fire at the mouth. Remonstrances were addressed to Marshal Soult, the minister of war, on this barbarity by foreign powers; but Marshal Bugeaud protected his subordinate, and accepted the responsibility of his action. Pelissier was consequently promoted to the rank of general of brigade. In this capacity he directed several campaigns with his usual energy, and in 1848 General Cavaignac placed him at the head of the province of Oran. In 1850 he was made general of division, and in 1851 interim-governor of Algeria. In this capacity he accepted the *coup-d'état* of December, but was soon after replaced by General Randon, and returned to his post as governor of Oran. In 1854 he received the grand-cross of the Legion of Honour, and early in the following year he received the command of the first corps of the army of the East on the outbreak of the war with Russia. On 16th May, 1855, he was ordered to replace Canrobert as commander-in-chief of the army in the Crimea; and by the vigour with which he pushed the siege on the part of the French, he justified the expectations which had been formed of him. The siege was crowned, on 8th September, by the capture of the Malakoff, which induced the Russians to sue for peace, and from which achievement Pelissier took his title (22d July, 1856). Immediately on the capture of the Malakoff Pelissier received his marshal's baton. The corps législatif voted him an annual pension of 100,000 francs, with descent to his direct heirs in the male line. He was successively named vice-president of the senate, a privy-councillor, and ambassador to England (1858). On the outbreak of the war with Italy (1859) he was recalled from London to take the command of an army of observation stationed at Nancy. In November, 1860, he was appointed Governor-general of Algeria. He occupied this post till his death, 22d May, 1864. He married in 1858, and had only one daughter.

PELLAGRA. The pellagra of the Lombardo-Venetian plains, a horrible malady, or complication of maladies, was first observed about a century ago, although it probably existed long previously, and has since that time been rapidly increasing. A sixth or seventh of the population are affected in those parts of the country where it is most prevalent. It begins by an erysipelatous eruption on the skin, which breaks out in the spring, continues till the autumn, and disappears in the winter, chiefly affecting those parts of the surface which are habitually exposed to the sun or air, is accompanied or preceded by remarkable lassitude, melancholy, moroseness, hypochondriasis, and not seldom a strong propensity to suicide.

wealth, early distinguished himself by his patriotic virtues, and lived in intimate friendship with Epaminondas, whose frugality he imitated, making a noble use of his wealth on behalf of the poor and unfortunate. Sparta, at this time the leading power in Greece, had alienated from Thebes the Bœotian cities; and in B.C. 382, when the Spartan general Phœbidas, assisted by a Spartan party headed by the Theban Leontiades, seized the Cadmeia (citadel of Thebes), Pelopidas, with other exiles, took refuge in Athens. These refugees returned in 379, and succeeded in overthrowing the Spartan party and recovering the Cadmeia, Pelopidas slaying Leontiades with his own hand. In the war which followed with Sparta Pelopidas took a leading part, and in B.C. 375 won the battle of Tegyra, which proved the precursor of Leuctra. In the latter battle, B.C. 371, after Thebes had been deserted by Athens, which had hitherto been her ally, Epaminondas, seconded by Pelopidas, defeated the Lacedemonians and slew their king Cleombrotus. By this battle Thebes became for a time the leading power of Greece. In B.C. 369 Pelopidas was one of the generals of the Theban force who invaded the Peloponnesus, and with Epaminondas took the responsibility of exceeding their orders and invading the Spartan territory. For this they were afterwards impeached and acquitted. In B.C. 368 Pelopidas was sent against Alexander of Pheræ, tyrant of Thessaly. From Thessaly he advanced to Macedonia, where he accommodated certain political differences, and brought away thirty hostages, among whom, it is said, was Philip, the father of Alexander the Great. In the same year he was again sent into Thessaly as an ambassador, unattended by a military force. While here he hired some mercenaries against Ptolemy, the murderer of Alexander, king of Macedon. After his return to Thessaly, while engaged in another expedition, he was seized by Alexander, and imprisoned until relieved by a Theban force under Epaminondas in 367, when he was immediately sent on an embassy to the Persian court. Here he was received with great distinction, all his demands being granted. In 364 he was again sent against Alexander. Relying on the support of the Thessalians, he took only a small force with him, and was victorious in action at Cynoscephalæ, but was slain in the pursuit. The Thessalians buried him with great lamentations, honoured his memory with statues and golden crowns, and bestowed large estates on his children.

PELOPONNESUS, a celebrated peninsula, which comprehends the most southern part of Greece. It received this name from Pelops, who settled there, as the name, *the Island (nesos) of Pelops*, indicates. It had been called before *Ægialea*, *Apia*, *Pelasgia*, and *Argos*. Its present name is *Morea*. Peloponnesus was divided into six provinces, Messenia, Laconia, Elis, Arcadia, Achaia, and Argolis, to which some add Sicyon. The Peloponnesus was conquered some time after the Trojan war by the Heraclidæ, or descendants of Hercules, who had been forcibly expelled from it. For an account of the Peloponnesian War see GREECE (ANCIENT).

PELOPS, son of Tantalus, king of Lydia. A fable, which Pindar considers blasphemous, relates that Tantalus once entertained the gods in his capital Sipylus, and, to prove their omniscience, served up to them the body of his son Pelops. Zeus discovered the trick, and ordered the limbs to be thrown again into the kettle, from which Clotho drew out the body alive, and supplied with ivory the shoulder which had been eaten by Demēter, who was absorbed by grief for the loss of her daughter. According to Pindar Poseidon carried the beautiful Pelops to the abode of Zeus. When Tantalus had made himself unworthy of the society of the gods Pelops was also sent back to the dwellings of men. According to the traditions most prevalent in later times Pelops was a Phrygian who was expelled by Ilus from his native country, and thereupon migrated with his immense wealth to Pisa in the Peloponnesus. Others describe him as a Paphlagonian, and in the older legends he is represented as a native of Greece, and not as a foreign immigrant. He became a suitor of the beautiful Hippodamia, and by conquering her father Œnomaus, king of Pisa, in a chariot race, through the treacherous connivance of Myrtilus, the king's charioteer, obtained the bride with a kingdom. Myrtilus had been gained by an offer of half the kingdom; but Pelops, being unwilling to keep faith with him, threw him from a cliff into the sea. The drowning man cursed his murderer, which was the cause of all the misfortunes that fell upon the house of Pelops. Peloponnesus received its name from him. Of his sons, Atreus and Thyestes are most celebrated. After death Pelops received divine honours, and a temple was built to him in the grove at Olympia, the games of which place he is said to have revived.

PELTIER EFFECT, a phenomenon observed by M. Peltier at the place of junction of two rods of metal, when a current is made to pass through both. It is well known (see THERMO-ELECTRICITY) that heat is transformed into electricity in a thermo-electric circuit. Now the electric current in passing through all parts of the circuit tends to heat the conductors, so that it would seem as if the current merely carried heat from the thermo-electric junction to other parts of the circuit, effecting an equalization of temperature. We here suppose that no external work, such as the moving of magnets, is done by the current. The heat is transformed into electricity at the hot junction, and also, as Sir William Thomson has shown, at portions which have different temperatures of one or both metals. Peltier discovered that a current flowing in a circuit composed of two metallic conductors heated one junction and cooled the other, and it came to be supposed that, as in a thermo-electric circuit, the currents hitherto observed had cooled the hot and heated the cold junction in the manner observed by Peltier, the heat producing the current was wholly absorbed at the hot junction, and given out at the cold junction, diminished by radiation, &c., and by the heat equivalent of the work done in the rest of the circuit. Sir William Thomson has shown that this explanation is incomplete. When the temperature of the junction is at the 'neutral point' (see THERMO-ELECTRICITY) the two metals are thermo-electrically identical, and no Peltier effect can occur, yet a current passes through a circuit when the hot junction is at the neutral point and the other is not, and therefore there must be absorption of heat somewhere else in the circuit than at the junctions. It has been proved that in a copper wire a current carries heat with it from a hot place to a cold one; whereas in an iron-wire a current carries heat with it from the cold places to the hot ones, thus retarding equalization of temperature throughout the circuit.

PELTRY (Latin, *pellis*, skin), the name given to the skins of different kinds of wild animals found in high northern latitudes, particularly in America, such as the seal, beaver, otter, wolf, fox, bear, &c. When such skins have undergone no preparation except drying they are termed peltry, but when the inner side has been tanned they are called furs. See FUR and FUR-TRADE.

PELUSIUM, a city of ancient Egypt, situated on the east side of the easternmost mouth of the Nile, which was called after it the Pelusian mouth. It was called by the Egyptians *Peremoun*, and by the

Hebrews *Sin*, which, together with its Greek name, signify mud-city. Its original name appears to have been *Abaris* or *Anaris*, and it is so called by Manetho, who informs us that it was founded about 2000 B.C. by the Shepherd Kings. It stood about 2½ miles from the sea, in the midst of a morass, but the coast line had so advanced that in the third century of our era the distance increased to 4 miles. As the key of Egypt on the north-east it was strongly fortified, and was the scene of many battles and sieges. We learn from Herodotus that while it was being besieged by Sennacherib, his camp was invaded by an innumerable host of field-mice, who gnawed the Assyrians' bow-strings and shield-straps, so that when they were attacked in the morning by the Egyptians under Sethos they were defenceless, and beaten off with great slaughter. Near it, in 525 B.C., Cambyses defeated Pharaoh Psammetichus. In 309 B.C. it was taken by the Persians, and under its walls Antiochus Epiphanes defeated Ptolemy Philometer in 173 B.C. It fell into the hands of Mark Antony in 55 B.C., and after the battle of Actium in 31 B.C. it opened its gates to Octavian. Its ruins, seen at Tineh, near Damietta, possess little interest.

PELVIS (Latin, *pelvis*, a basin), the bony basin formed by the 'haunch-bones' and sacrum of Vertebrata, which constitutes the girdle or arch giving support to the lower or hinder limbs. The pelvis thus corresponds to the shoulder-girdle of the upper or fore limbs; and forms a cavity or basin in which several of the abdominal viscera, and organs relating to reproduction and the urinary functions, are protected and contained. The pelvis is formed on the sides and in front by two bones, each of which is known as an *os innominatum*. This, the chief bone of the pelvis, although consisting of but a single bone in the adult, is in the young state composed of three distinct bones, known respectively as the *ilium*, *ischium*, and *pubes*. These bones unite firmly about the twenty-fifth year of life. They unite together to form a deep cup-shaped cavity, known as the cotyloid cavity or *acetabulum*, which receives the head of the femur or thigh-bone, and thus forms the hip-joint. To this cup the ischium and ilium each contribute two-fifths of its extent, the pubes making up the remaining one-fifth. The acetabulum shows on its lower surface a depression, to which the *interarticular ligament* of the hip-joint is fixed. From the acetabulum the ilium rises backwards and upwards, and constitutes the 'haunch' of popular language, and thus forms the chief upper boundary of the pelvic basin. The ischium passes backwards and downwards from the acetabulum, whilst the pubis proceeds inwards and forwards, and joins its fellow of the opposite side to form the front wall of the pelvis. Behind, the innominate bones articulate with the sacrum—composed of several vertebræ united together in one bone—which thus forms the posterior or back wall of the pelvis. By the *true pelvis* anatomists mean that portion of the pelvic cavity or basin which lies below the base or broad portion of the sacrum, and the pectineal lines which run backwards from the spine of the pubis, one on each side, the lower boundary or outlet of the true pelvis being bounded in front by the arch of the pubis, at the sides by the tuberosities of the ischia, and behind by the coccyx or terminal vertebræ of the spine. The *false pelvis* lies above the true pelvis, and corresponds to the wider space contained within the expanded wings of the ilia. The pelvis is inclined in the erect attitude of man so that the plane of its brim forms with the horizontal plane an angle of from 60° to 65°. The axis of the pelvic cavity may be figured by a line passing perpendicularly to the planes of its brim, cavity, and outlet. The axis of the brim is directed upwards and forwards, that of the outlet passing downwards and slightly forwards. The inclination of the pelvis raises the base or upper part of the sacrum about 4 inches above the front portion or *symphysis* of the pubis.

The pelvis of man differs materially from that of woman, the differences having chiefly reference to the greater capacity required for the womb or uterus during pregnancy, and for the expulsion of the child at birth. The ilia in woman are more expanded than in man, giving to the female haunches their greater breadth. The female pelvic inlet is wider and more circular, whilst the pubic arch is also wider in woman. The pelvis of woman, as a whole, is also of lighter weight than that of man. The average width between the ilia of a well-formed man is about 9 inches, and between those of a well-made female about 11 inches. A certain degree of mobility of the pelvis upon the thighs is provided, which is utilized in the movements of walking. (See LOCOMOTION, ANIMAL.) The pelvic contents include part of the small intestines, the rectum or terminal portion of the large intestine, the bladder, the internal generative organs, the large nerves and blood-vessels which supply the lower limbs, and many absorbent vessels and glands. Complicated muscular attachments also exist in connection with the attachment of the pelvis to the trunk, and with that of the lower limbs to the pelvis.

The pelvis varies greatly in development and perfection even in the mammalia. It may be very rudimentary, as in Cetacea, where the two ischia are alone represented, and exist as slender bones detached and separated from each other and from the spine as well. No posterior limbs are thus developed in Cetacea, if we except rudimentary thigh-bones, present in the whale-bone whales (Balænoidea). In the nearly-allied Sirenia (dugongs and manatees) the pelvis is also rudimentary in nature, and in the latter forms no traces of hind limbs have been met with. In the Mammalia generally the pelvis is always more elongated and narrower than in man. It is much elongated in Bats and Insectivorous Mammalia; its halves being connected at the pubis by ligament only, or being, as in many bats and in moles and shrews, wholly unconnected and separate in front. In no birds, save in the ostriches, are the pelvic halves united at the symphysis pubis. In all birds, and in the Echidna or porcupine ant-eater, the acetabulum is perforated. The Monotremata and Marsupialia possess what are termed 'marsupial bones,' attached to the front of the pelvis brim or pubes. (See MAMMALIA, MARSUPIALIA, and MONOTREMATA.) These bones are merely the ossified inner tendons of the external oblique muscles of the abdomen, which in kangaroos, &c., support the marsupium or pouch. The ischia are the most constantly represented elements in the mammalian pelvis. In the penguins among birds the innominate bones are not united by bone to the spine, but are rendered slightly movable by ligamentous attachments, a conformation rendering the gait of these birds of a waddling kind. In tortoises and turtles, and in Crocodilia, among reptiles, the disposition of the pelvis resembles that of man. In some snakes (for example, boas, pythons, Tortrix, &c.) a rudimentary pelvis exists, and in some of these an abortive thigh-bone is also represented. In all Amphibians the representative of the ilium is invariably represented in the pelvis, and an ischium in all except Proteus. In fishes many variations exist in the degree of perfection of the pelvic elements. The ilium of fishes is almost invariably absent, being but faintly represented in the angler-fish and in the Chimæra. In no fish are the pelvic elements attached by bony union to the spine. The *ossa innominata*, or innominate bones of fishes, consist probably of ischio-pubic

bones, or of cartilages alone; and in many fishes these pelvic elements are connected to the bones of the shoulder-girdle, as in those fishes in which the ventral fins (the hind-limbs of fishes) are jugular in position—that is, placed on the throat and beneath the pectoral or 'breast' fins, as in the cod, &c.

PEMBA, or HUTHERA, an island off the east coast of Africa, 20 miles from the mainland, and about 40 miles north from Zanzibar, about 40 miles long by 10 miles broad. It is low, well-wooded, and fertile; rice is cultivated, and carried to Zanzibar. At the head of a deep inlet on the west side stands Chak-Chak, the chief port, fort, and town.

PEMBROKE, or PEMBROKESHIRE, a maritime county of South Wales, forming the extreme west of the principality; bounded on the north-east by Cardiganshire, east and south-east by Carmarthenshire and bay, south by Bristol Channel, and west and north-west by St. George's Channel; area, 391,181 acres. Its coast-line is deeply indented with numerous bays and inlets, and studded with islands. The shores also are in general high, and the cliffs perpendicular. The surface is generally undulating, and greatly diversified with hills and dales, decorated with rich meadows and corn-fields. The hills, however, do not attain any great elevation; the highest summit, Precelly Top, being but 1754 feet above sea-level. The anthracite or stone-coal tract bisects the county; it is a continuation of the great coal-basin of South Wales. Copper ore has been found in small quantities; but lead, iron, slate, and coal are the only minerals worked. In the south part the limestone and old red sandstone formation afford soils of excellent quality, but in the coal and slate districts the land is very inferior. The climate is humid and very mild. The soils approaching the sea-shore have long been celebrated for the production of barley. Wheat, oats, and potatoes are the principal crops. In 1883 there were 55,011 acres under corn crops, 13,266 under green crops, 28,409 under grasses and clover in rotation, and 206,052 permanent pasture. There were 83,436 cattle and 91,901 sheep in the county. Black-cattle are fattened and sent to the London market. The horses are small sized, but much esteemed. Manufactures are unimportant, and chiefly domestic, consisting mostly of coarse woollen articles of clothing; the fisheries are valuable, particularly those of herrings. Chief towns—Haverford-West, Pembroke, Pembroke Dock, St. David's, and Tenby. The county sends a member to Parliament. Pop. in 1871, 91,998; in 1881, 91,824.

PEMBROKE, a parliamentary and municipal borough and seaport town of South Wales, capital of the county of the same name, situated on a creek on the southern side of Milford-Haven, 206 miles west of London. It has a town-hall, assembly-rooms, a parish and several other churches, and places of worship for Dissenters; National, British, and other schools, &c. At the western extremity of the rocky ridge on which the town stands are the fine picturesque ruins of an ancient castle or fortress erected in 1092, the remains of which give evidence of its former magnificence. About 2 miles north-west from the town is situated Pembroke Dock, otherwise called Pater. The government dock-yard comprises an area of about 80 acres, and is inclosed by a lofty wall of stone, which includes various public offices, a chapel, and residences for the principal officers. It contains several slips for ship-building. The town, recently built here, consists of several streets of neat and well-built houses, partially paved, with numerous good shops, and a neat inclosed market-place. Pop. of the municipal borough in 1871, 13,704; in 1881, 14,156. Pembroke unites with Milford, Tenby, and Weston in sending a member to Parliament.

PEMBROKE COLLEGE, CAMBRIDGE, was founded in 1347, under the name of Valence-Mary, by Mary de St. Paul, widow of Aymer de Valence, earl of Pembroke, who was killed on his wedding-day at a tilting match held in honour of the bride, who, in consequence of this sad catastrophe, retired from the world, bequeathing her estate to pious uses. King Henry VI. was so liberal a benefactor to the college as to obtain the name of a second founder. There are thirteen fellowships open to fellows of every nation, and unrestricted as to counties. There are twenty-nine scholarships perfectly open, varying in value from £80 to £20 a year. The college has the patronage of twelve livings. The buildings were greatly added to and altered between the years 1870 and 1883. The chapel, which is Corinthian in style, was built by Sir Christopher Wren in 1663. Among the most noted members of the college may be mentioned Ridley, the martyr, Archbishops Grindal and Whitgift, Spenser and Gray, the poets, William Pitt (the younger), the statesman, &c.

PEMBROKE COLLEGE, OXFORD, originally Broadgates Hall, was founded in the year 1624 by James I., and obtained its name from William Herbert, earl of Pembroke. The constitution of the college, by an ordinance of the commissioners under the statute 17 and 18 Vict. cap. lxxxi., is as follows:—The college is to consist of a master, not less than ten fellows, and of not less than twelve scholars. The fellowships are open to all, and do not exceed £200 a year so long as the number of fellowships does not exceed sixteen. There are at present twenty-four scholarships, all of which are tenable for five years, with the exception of the Townsend scholarships, which are tenable for eight years; the holders, however, sharing in the emoluments during four years only.

PEMMICAN, originally a North American Indian preparation, consisting of the lean portions of venison cut into thin slices, divested of fat, and dried in the sun. As meat thus preserved contains the largest amount of nutriment in the smallest amount of space, it was introduced into the government victualling-yards, where it is made of beef cut into thin slices, pounded, then mixed with about its own weight of melted fat, and sometimes dried fruit, and then compressed into bags. It is chiefly used in long arctic explorations.

PEN, an instrument for writing with a fluid. Pens of some sort have been in use from very early times, adapted to the material on which the characters were to be inscribed. On stone or metallic plates, steel gravers were used; this is the iron pen of Job xix. 24. For the wax tablets a metallic stylus was used, one end of which was sharpened for marking, and the other was flattened for erasing the marks, and smoothing the wax. Letters were also frequently painted with a fine hair pencil, a practice which is common in China at the present day. Pens of reeds were made at a very early period, for writing with ink upon papyrus. The reed employed is described as small and hard, and about the size of a swan's quill. It has been asserted that quills were used for writing as early as the fifth century A.D., according to the history of Constantius. The oldest certain account is a passage of Isidore, who died 636 A.D., and who, among the instruments used in writing, mentions reeds and feathers. The quills generally used were those of the goose and swan, and for extremely fine writing those of the crow. Up till the end of the first quarter of the present century these formed the principal materials from which pens were made. As from each goose only ten or twelve good quills on an

acceptance and performance of certain penitential works in atonement of the sin; and the form of the sacrament is the sentence of absolution from sin pronounced by the priest who received the confession, and has been satisfied of the earnest repentance of the sinner. According to the doctrine of the Protestants there is no such sacrament; they consider repentance and faith as the only requisites for forgiveness.

PENANG, Pulo-Penang, or Prince of Wales Island, an island belonging to Great Britain, lying at the north entrance of the Straits of Malacca, off the west coast of the Malay Peninsula, from which it is separated by a channel 2 to 5 miles across; length of the island, 14 miles; breadth, 8 miles; area, about 106 square miles, or 68,000 acres. The settlement of Penang also includes Province Wellesley, a long strip of the Malay Peninsula opposite the island; this strip is 28 miles long by 8½ broad; area, about 233 square miles, or 149,000 acres. The greater part of Province Wellesley is fertile plain, and the remainder, about one-eleventh of the whole, consists of low wooded hills, the highest of which reaches a height of 1843 feet. Two-fifths of Penang is plain, and the rest hills—for the most part wooded—which rise to a height of 2734 feet. The climate is hot, but very healthy; bracing sea-breezes blow every day, and rain falls every month during the year except January and February; temperature from 76° to 90° Fahr. The scenery is very beautiful, not unlike that of the Western Highlands of Scotland, though with softer features. The rocks are granite and mica schist; the soil a rich vegetable mould. The settlement produces sugar, rice, and cocoa-nuts in abundance; together with coffee, cloves, areca-nuts, ginger, sweet-potatoes, the pine-apple, shaddock, banana, orange, lemon, plantain, mango, guava, &c. Of the 217,000 acres forming the total area of the settlement over 65,000 are under rice, 37,000 under cocoa-nut trees, 14,000 under sugar-cane, and 10,000 under areca-trees, while about 81,700 acres are uncultivated, and of which only about 500 are uncultivable. Amongst timber trees are the teak, dammar-pine, caoutchouc, cypress, &c. Tigers, civets, wild-cats, monkeys, wild oxen, and hogs are natives, as are also pelicans, pea-fowl, adjutants (a kind of stork), and numerous species of brilliantly-plumaged birds. Buffaloes and cattle are extensively raised for dairy or farm purposes, and hogs in great numbers by the Chinese for food. Goats and sheep are scarce, but poultry are plentiful. The coasts abound with fish, twenty varieties of which, chiefly caught by the Malays, are brought to the market. Tin-ore is abundant, but little wrought. George Town, or Penang, as it is generally called, the capital and port of the settlement, is situated on a tongue of land on the east side of the island. It has a population of nearly 60,000 inhabitants, principally Chinese, many of them merchants and shopkeepers. It is a handsome town, and is rapidly increasing in size. The port is approachable only by the north channel. The value of the total imports in 1882 was £4,908,795; that of the total exports in the same year, £5,594,736. The population of the settlement is rapidly increasing; according to the census returns of 1871 it numbered 133,230; at the census of 1881 the total population was 190,597, of whom 674 were European, 67,820 Chinese, 84,775 Malays, 25,173 Tamils, and 12,155 Jawi Pekans (a class of Malays by intermarriage with natives of India), and other races. Penang was made over by treaty to the East India Company in 1786 by the Rajah of Queda, and in 1805 was erected into a separate presidency. In 1830, however, four years after Malacca and Singapore were incorporated into the Straits Settlements, the whole three were united under a governor subordinate to the Presidency of Bengal. They were removed from the control of the India office in 1867, and now hold the position of a crown colony with a common governor, Penang and Malacca having each a lieutenant-governor.

PENATES, the private or public gods of the Romans. The images of these gods were kept in the penetralia, or central part of every house. The Lares were included among the Penates, but were not the only Penates; for each family had generally but one Lar, whereas the Penates are usually spoken of in the plural. As Jupiter and Juno were regarded as the protectors of the happiness and peace of the family, these divinities were worshipped as Penates; and each hearth, as the symbol of domestic union, had its Vesta. The most celebrated at Rome were those that protected the empire. These were believed to have been brought into Italy by Æneas, together with Vesta and her eternal fire. They stood in a chapel near the centre of the city, in a place called Sub Velia. According to Varro and Macrobius the Penates were rude images of wood or stone furnished with a spear; and generals, on their departure, and consuls, prætors, and dictators, when they retired from office, sacrificed victims before them.

PENCIL, an instrument used for painting, drawing, and writing. The first pencils used by artists were probably pieces of coloured earth or chalk cut into a form convenient for holding in the hand. With such instruments the monochromes, or one-coloured pictures, of the Egyptians and Greeks were drawn. On the introduction of wet colours, however, delicate brushes of fine hairs were used. Pencils of this kind, and of various degrees of fineness, are now almost solely used by painters for laying on their colours; but in China and Japan they are generally employed, instead of pens, for writing. The hairs used for these pencils are obtained from the camel, badger, squirrel, sable, goat, &c. The finest pencils require very careful selection and arrangement of the hairs; their naturally fine points must all be in one direction; the central one must project the farthest, all the others receding in succession, so as to form a smooth cone terminating in a sharp point. The hairs, being selected, are bound in a little roll by a string tied tightly round their root ends; the points are also temporarily bound together. The roll is then introduced into the large end of a quill tube, which has been softened by moisture. As the quill dries the increased pressure caused by its contraction holds the hairs securely in their place; but the pressure should not be so great as to make the points spread apart when they are untied. For larger pencils a socket of tin-plate is used instead of the quill. Black-lead pencils, for writing or drawing, are made of graphite or plumbago, the finest qualities of which are found in the Borrowdale mines in Cumberland, and in Siberia and other parts of Russia. Inferior kinds are also found in Austria, Prussia, Ceylon, and several districts in North America, but they are only used for low-priced pencils. Blocks of graphite are now rarely found of sufficient size and purity that they can be sawn up into the small square slices of ordinary pencil length; but fortunately a method has been devised of purifying the more gritty varieties, which are ground to a fine powder, which is levigated or washed until it is pure, and then compressed by hydraulic presses into solid blocks, from which slices are cut as good as those originally obtained from large blocks of unprepared graphite. Simple as the process of pressing the powder into blocks may appear, it was at first found very difficult in practice: the difficulty of pressing out the contained air was so great that the presses broke under the strain. The

idea of operating in a vacuum was suggested, but it was found, if not quite impossible, at least unprofitable to introduce under the receiver of an air-pump an apparatus for compressing the powder. The difficulty was at last surmounted by Mr. Brockedon of London by an arrangement as simple as it is easily executed. After compressing the powder into blocks of 2 or 3 inches square with moderate pressure, they are coated with very thin paper glued over the whole surface. A small hole is then made in one side of the coating, several blocks are placed in the receiver of an air-pump, and the air having been removed the orifice in each is closed by an adhesive wafer, which prevents the return of the air when they are taken out of the receiver. They are then submitted to a regulated pressure for about twenty-four hours, and when the coating is removed the blocks are found as solid as specimens from the mine. The various shades of darkness in the best drawing pencils is secured by the selection of specimens of graphite of varying degrees of density, but it is commonly obtained by adding sulphur or sulphuret of antimony, and by subjecting the graphite to the action of heat. For the cheapest sorts the worst quality of plumbago is mixed with black chalk and size and formed into a paste. To prevent the small square slip from breaking and soiling the hands it is inclosed in a case of wood. The wood generally employed is cedar, and is sawn first into thin boards about half the thickness of the intended pencils; these are cut into pieces about 10 inches long by 6 inches wide. They are then ready for the grooving-engine, which consists of two revolving saws going at inconceivable speed; one saw cuts the wood into narrow square rods; the other, placed within the eighth of an inch of it, makes a fine square groove along the rod, and cuts it to size at the same time. Adjoining the grooving apparatus is another circular saw, which cuts slips of wood as covers to the grooved lengths. These two rods, with the prepared slice of graphite fitted into the groove, are handed to the fastener-up, who glues the inner surfaces, presses them together, and sets the rod to dry; they are then passed through the rounding machine, dressed with a semicircular plane, cut at the ends, and polished by rubbing with a shark-skin—this latter operation being performed by girls. They are finally stamped with the maker's name and with the letters indicating their quality—H, HH, HHH standing for hard, harder, and very hard; B for black, and repeated for the deeper shades; HB for hard-black; FS for fine stroke; and so on. Coloured pencils are prepared by the use of various chalks, such as are used for crayons, instead of the graphite. The chalk is reduced to powder, mixed with a little hot melted wax to give it softness and adhesiveness. It is then pressed, cut, and cased, as already described. Pencils for writing on slate are made by cutting slate into small square pieces and rounding them, or into narrow slips and incasing them with cedar covers, as above.

PENDANT, or PENNANT, in the royal navy, a sort of long narrow banner with St. George's Cross in the head, displayed from the main mast-head of a ship-of-war, and usually terminating in two ends or points, called the *swallow's tail*. It denotes that a vessel is in actual service.

Broad pendant is a kind of flag terminating in one or two points, used to distinguish the chief of a squadron.

Pendant is also a short piece of rope fixed on each side, under the shrouds, upon the heads of the main and fore masts.

Rudder pendants are strong ropes made fast to a rudder by means of chains; their use is to prevent the loss of the rudder if by any accident it should get unshipped.

PENDANT, in architecture, is an ornamented polygonal figure of stone or wood hanging from the roof, vault, or staircase of a Gothic building. Fine examples of stone pendants are to be seen in the chapel of Henry VII. at Westminster Abbey.

PENDULUM, a heavy body suspended so that it is free to turn about an axis, not vertical, which does not pass through its centre of gravity. Its only position of stable equilibrium is that in which its centre of gravity is in the same vertical plane with the axis. If the body is displaced from the position of equilibrium it will tend to return to that position, and it will oscillate from one side of that position to the other until its energy is destroyed by friction, and it at length comes to rest. If the friction at the axis is small enough to be neglected, and if the body is surrounded by a vacuum, its swings are all sensibly the same, and are all executed in the same time. The time taken by the body to pass from a given position and to come again to that position under the same circumstances is called 'a period,' or the complete period of its oscillation. If the circular motion of any point of the body is carefully observed, it will be found not to be truly harmonic (see MECHANICS), and the period of a great oscillation is found to be somewhat longer than the period of a small one. However, if the displacement of the body from its position of rest is never very great, the period of its oscillation is sensibly constant, and depends on the shape and mass of the body, and on the position of the axis of suspension. The length of the path of a point during a complete vibration is called the 'amplitude' of the vibration.

The *cycloid* is a well-known curve in geometry; it has the peculiar property that when its axis is vertical, if a heavy small body be constrained to remain on the curve, and if it fall without friction along the curve by the action of gravity, the periods of its oscillations are all exactly equal whether the lengths of its vibrations to one side and the other of of the axis be great or small. Now a small, heavy body, suspended by a fine, inextensible thread between two cycloidal 'cheeks,' is known to move in a cycloidal path, so that the oscillations of such a body are isochronous. This arrangement is called a 'cycloidal pendulum.' (See CYCLOID.) A small, heavy body suspended from a fixed point by a string, and caused to vibrate without much friction, is called a 'simple pendulum.' In investigating the motion the string is supposed to be inextensible, the body is supposed to be a heavy particle—that is, to have mass and yet to be infinitely small, and there is supposed to be no friction either at the point of support or from the viscosity of the air. If a simple pendulum and a cycloidal pendulum of the same length are set vibrating near each other the cycloidal one may be used as a measurer of time, and it will soon become evident that the periods of vibration of the simple pendulum are longer than those of the cycloidal, but that their disagreement gets less and less as the swings get smaller and smaller, and when the simple pendulum has come nearly to rest the periods are sensibly the same. Thus, when the swings of a simple pendulum are not too great—that is, when they are never more than about 3° on each side of the position of rest—the pendulum is sensibly isochronous, and its period is true to the law[1]—

$$T = 2\pi\sqrt{\frac{l}{g}};$$

where T is the period of a complete vibration (readers will remember that 'the time of vibration' of a pen-

[1] To show that for small swings the simple pendulum is

dulum, which is a term commonly employed, is half a complete period), where π is the well-known mathematical number 3·1416, where l is the length of the pendulum in feet, and g, the acceleration due to gravity, is 32·19 feet per second at London. The 'seconds' pendulum has for its time of vibration (half its complete period) one second. In the above equation, putting for T two seconds, and for g 32·19, we find the length of the seconds pendulum at London to be 3·26 feet, or 39·1398 inches. The proof of the above law will be found in treatises on mechanics. An approximate experimental proof is very easy; a small lead bullet may be suspended by a fine silk thread, and set swinging; a stop-watch in hand, count how many swings the pendulum makes in say two minutes, and calculate the approximate period of one vibration in seconds; it will be found to satisfy the law which we have given. It is evident that the law enables us to calculate g for any place if we know the length of a simple pendulum and the period of its swing at that place. In the article GRAVITY (FORCE OF) a table is given of the lengths of the seconds pendulum, as determined by experiment, at different places on the earth, and g in feet per second as calculated from these lengths.

A true simple pendulum is a mathematical abstraction. A heavy particle, an inextensible and inflexible weightless string, and no friction; these conditions are only approximated to in nature. The table of lengths of simple seconds pendulums, referred to above, was determined from experiments with large masses of metal called 'compound pendulums.' A compound pendulum is usually a rigid, heavy, pendulous body; friction is much lessened by supporting the body on a steel knife-edge resting on a table of agate. When the vibrations of a compound pendulum are small they are isochronous, and the period of vibration may be calculated when the distance of its centre of gravity from the axis and the 'moment of inertia' (which see) of the body about the axis are known. Thus if I is the moment of inertia, and h the distance from the axis to the centre of gravity, it may be proved that the length of the simple pendulum which has the same period of vibration as the compound one is

$$\frac{I}{M h}.$$

Through G, the centre of gravity of a body, draw a perpendicular to the axis meeting it in C; then C may be called the centre of suspension. CG is h in the above formula. If CG is produced to O, so that CO = l, the length of the equivalent simple pendulum, then O is called the 'centre of oscillation' of the compound pendulum. If the whole mass of the body were gathered at O, and suspended by a thread to C, its period of vibration would of course be the same as that of the compound pendulum. It may be shown that the centres of oscillation and suspension are convertible, the period of oscillation about each being the same. Interesting deductions as to the position of the axis about which a body will vibrate most rapidly will be found in Thomson and Tait's Elements of Natural Philosophy. When the length, l, of the equivalent simple pendulum is known, a compound pendulum may be used to determine the force of gravity at any place. Now the calculation of l by first accurately calculating the moment of inertia is rather difficult, and Captain Kater proposed to employ the principle of convertibility of the centres of oscillation and suspension in obtaining accurate results. A body, part of whose mass may be shifted in its position relatively to the rest, is suspended at a point C, and then inverted and suspended at a point O, as nearly as possible the old centre of oscillation. By several trials and shiftings of the moveable weight the periods of vibration about C and O are made exactly equal, and when this is done the distance from C to O is the length of the corresponding simple pendulum. Knife-edges are employed at C and O. As l is now determined, it is only necessary to find T for the use of the formula in calculating g. The 'method of coincidences' is employed in determining T. Suppose the observer to have a good clock. Certain marks made on the experimental pendulum and on the clock pendulum are observed by a telescope at the lowest points of their arcs of vibration. These lowest points are in one line with the observer. A diaphragm on the telescope limits the field of view to a very narrow aperture, and across this aperture the marks are seen to pass. Supposing the period of the clock pendulum to be somewhat less than that of the body, the clock will gain on the body, and at length, at a certain vibration, the marks on the two pendulums will coincide in their passage through the field of view. The marks will now begin to separate, and after a time they will again coincide in their passage. If the pendulums vibrate regularly the time between the two coincidences will be measured by a certain integral number of complete vibrations of the clock pendulum and by an integral number, one less than the former, of vibrations of the experimental pendulum. A simple proportion enables T to be calculated. Thus if the period of a complete vibration of the clock is two seconds, and if thirty complete vibrations of the clock correspond to twenty-nine of the experimental pendulum, as the periods are inversely proportional to the numbers of vibrations in the same time—

29 : 30 :: 2 : 2·069.

So that T = 2·069 seconds. The values of T thus found and the values of l determined from T by our first formula require some corrections or 'reductions.' The centre of oscillation does not describe a cycloid; the point of support is not absolutely fixed; the air has viscosity and buoyancy; the length changes with change of temperature. After correcting for these disturbing influences, and calculating g, it is necessary to correct for height above the sea-level, the attraction of intervening land, the rise of the sea supposing the land removed, &c.

The length of the seconds pendulum may be regarded as a fixed length, capable of being recovered at any time if employed as a standard. An act of Parliament, 5 Geo. IV., defines the yard to contain thirty-six equal parts such that there are 39·1393 of them in the length of a pendulum vibrating seconds of mean time in the latitude of London in vacuo at the level of the sea at temperature 62° Fahr. But in 1834 the commissioners appointed to consider the restoration of standard weights and measures, lost in 1834 by fire, reported that several elements of reduction of pendulum experiments were not trustworthy enough for the determination of a standard of length, and they recommended a material standard —the distance between two marks on a certain bar of metal under given circumstances—in preference to any standard derived from measuring natural phenomena. See LENGTH.

In a clock it is necessary that the period of vibra-

almost isochronous, we here give the complete formula. T, π, l, g are as above, h is the versed sine of the arc of oscillation.

$$T = 2\pi\sqrt{\frac{l}{g}} \times \left[1 + \left(\frac{1}{2}\right)^2 \frac{h}{2l} + \left(\frac{1\times 3}{2\times 4}\right)^2 \left(\frac{h}{2l}\right)^2 + \left(\frac{1\times 3\times 5}{2\times 4\times 6}\right)^2 \left(\frac{h}{2l}\right)^3 + \text{&c., } ad\ infinitum.\right]$$

For small swings $\frac{h}{2l}$ is exceedingly small, and may be neglected.

tion of the pendulum should be constant. (See CLOCKWORK.) As all substances expand and contract with heat and cold, the distance from the centre of suspension to the centre of gravity of a pendulum, and also its moment of inertia, are continually altering. It has been seen, however, that the length of the equivalent simple pendulum depends merely on the ratio of these two quantities, and not on their absolute magnitudes. Pendulums constructed so that increase or diminution of temperature do not affect this ratio are called compensation pendulums. For an account of the various methods of compensating pendulums the reader must be referred to treatises on clocks. For Robin's ballistic pendulum see MOMENT OF INERTIA.

PENELOPĒ, in classic mythology, the daughter of Icarius and Peribœa of Sparta. When she reached womanhood her extraordinary beauty attracted many suitors, and her father promised to give her to the conqueror in a foot race. Odysseus (Ulysses) won the prize, but Icarius tried to persuade his daughter not to accompany Odysseus to Ithaca. The young victor allowed her to decide for herself, whereupon she covered her face with her veil to hide her blushes, thus intimating her desire to follow her husband. The fruit of the marriage was an only child, Telemachus, who was but an infant when his father sailed against Troy. During the protracted absence of Odysseus he was generally regarded as dead, and Penelopē was surrounded by a host of suitors, whom she put off on the pretext that before she could make up her mind she must first finish a large robe which she was making for her father-in-law Laërtes. To gain time she undid by night the work she had done by day. Her stratagem was at last communicated to the suitors by her servants, and her position became more difficult than before; but fortunately Odysseus returned in time to protect his chaste spouse. Such is the simple and touching Homeric legend, but some later writers give Penelopē a very different character; they assert that she became the mother of Pan by Hermes or by all the suitors together; that her husband repudiated her on his return, and that she went to Sparta and thence to Mantinea, where her tomb was shown in after ages.

PENGUIN, a genus of Natatorial or swimming birds, sometimes included in the Alcidæ or Auk family, at other times included in a special and distinct group, to which the name of the Spheniscidæ is given. The Penguins form members of the Brevipennate section of the Natatores, and possess rudimentary wings, destitute of quill-feathers, and covered with a scaly integument or skin. Although useless as organs of flight, the wings are very effective aids in diving; and on land they may be used after the fashion of fore-limbs. The hinder toe is rudimentary, or wanting in some species. The toes are completely webbed. These birds exist in immense numbers in the Antarctic seas. They occur on the South African and South American coasts, being found in large flocks at Terra del Fuego and on the Pacific Islands. They are gregarious in habits. On shore these birds have the habit of standing in long, regular lines, resembling files of soldiers drawn up in military array. From the fact of the limbs being placed quite at the hinder extremity of the body, these birds naturally assume an erect attitude when on land; this circumstance, together with their rudimentary wings and curious habits, giving to these birds a grotesque appearance. The female incubates the eggs, holding them between the thighs; and they are said to carry off the eggs in the same fashion when disturbed or alarmed. The male supplies the female with food during incubation, both parents feeding the young after they are hatched. The nests are formed in the hollows of rocks, and the eggs are deposited on the thick layer of excrement, which, accumulating through long periods of time, constitutes the valued guano of commerce. The Penguins will retaliate and defend themselves when attacked; but they are in general lazily-inclined birds, and may be killed readily and in numbers by blows from a stick. Several species (for example, the King Penguin) are said to steal and devour the eggs of smaller species. As a family the Penguins represent, in the southern seas, the nearly-allied Auks of the northern and Arctic regions. The Jackass Penguin (*Spheniscus* or *Aptenodytes demersus*), found at the Falkland Islands; the King Penguin (*A. Patagonica*, see Pl. CLII.–CLIII. fig. 16), of the Straits of Magellan; the Macaroni or Crested Penguin (*A. Chrysocome*); and the *A. Papua* are known species. The Great Magellanic Penguin (*A.* or *Spheniscus Magellanicus*) averages about 2 feet in length, and weighs from 30 to 40 lbs. This latter is the largest species.

PENITENTIAL PSALMS, the seven psalms vi. xxxii. xxxviii. li. cii. cxxx. cxliii. of the Authorized Version, corresponding with vi. xxxi. xxxvii. l. ci. cxxix. cxlii. of the Vulgate. They are so termed as being specially expressive of contrition, and generally accepted by Christians as forms of prayer suitable for the repentant. They seem to have been selected at an early period, and reference is made to them by Origen. By order of Innocent III. they had to be recited in Lent, and several popes attached an indulgence to their recital. They have a special place in the breviary of the Roman Church. The psalm most frequently repeated as being the most penitential is the Miserere, the li. of the Authorized Version.

PENITENTIARY, a prison in which convicted offenders are confined and subjected to a course of discipline and instruction with a view to their reformation. Penitentiaries were instituted by act 19 George III. cap. vii., the principal objects being by sobriety and cleanliness—by a regular course of labour—by solitary confinement during the intervals—and by religious instruction, to preserve and amend the health of offenders, to accustom them to habits of industry, to guard them from pernicious company, and to teach them the principles and practice of moral and social duty. See PRISON DISCIPLINE.

PENN, WILLIAM, was born in London in 1644. He was the only son of Sir William Penn, vice-admiral of England in the time of Cromwell, and afterwards knighted by King Charles II. for his successful services against the Dutch. He appears to have been seriously inclined from his youth, having imbibed religious impressions as early as his twelfth year, which were soon afterwards confirmed by the ministry of Thomas Loe, an eminent preacher among the Quakers. In his fifteenth year he was entered as a gentleman commoner of Christ Church, Oxford, where, meeting with some other students who were devoutly inclined, they ventured to hold meetings among themselves, wherein they both preached and prayed. This gave great offence to the heads of the college, by whom these zealous tyros were at first only confined for nonconformity; but persisting in their religious exercises, neglecting to attend church services, and stripping some of their fellow-students of their gowns, they were finally expelled the university. His father endeavoured in vain to divert him from his religious pursuits, but finding him inflexible, beat him severely, and turned him out of doors. Relenting, however, at the intercession of his mother, he sent his son to Paris, whence he returned so well skilled in the French language, and other polite accomplishments, that he was again joyfully received at home. After his return from France he was admitted of Lincoln's Inn, with a view of studying the law, and continued there till his twenty-

second year, when his father committed to him the management of a considerable estate in Ireland. At Cork he met again with Thomas Loe. Penn from that time constantly attended the meetings of the Quakers, though in a time of hot persecution. He was soon afterwards, with many others, taken at a meeting in Cork, and carried before the mayor, by whom they were committed to prison; but young Penn was soon released, on application to the Earl of Orrery, then lord-president of Munster. His father remanded him home; and finding him unalterably determined to abide by his own convictions of duty, in respect to plainness of speech and deportment, he would have compounded with him if he would only have consented to remain uncovered before the king, the Duke of York, and himself. Being disappointed in this he could no longer endure the sight of his son, and a second time drove him from his family. Yet after a while, becoming convinced of his integrity, he permitted him to return; and though he never openly countenanced him, he used his interest to get him released when imprisoned for his attendance at religious meetings. In the year 1668, in the twenty-fourth year of his age, Penn first appeared as a minister and an author, and it was on account of his second essay, entitled The Sandy Foundation Shaken, that he was imprisoned in the Tower, where he remained seven months, during which time he wrote his most celebrated work, No Cross, no Crown, and finally obtained his release from confinement by an exculpatory vindication, under the title of Innocency with her Open Face. In 1670 the meetings of Dissenters were forbidden, under severe penalties. The Quakers, however, continued to meet as usual; and when forcibly kept out of their meeting-houses, they assembled as near to them as they could in the street. At one of these meetings William Penn preached to the people thus assembled for divine worship; for which he was committed to Newgate, and at the next session at the Old Bailey was indicted for 'being present at, and preaching to, an unlawful, seditious, and riotous assembly.' He pleaded his own cause, though menaced by the recorder, and was finally acquitted by the jury; but he was, nevertheless, detained in Newgate, and the jury fined. Sir William died this year, fully reconciled to his son, to whom he left an estate of £1500 a year, together with claims upon government for £16,000. Shortly after this event Penn visited Holland and Germany. In the year 1672 he married Gulielma Maria Springett, whose father (Sir William) having been killed at the siege of Bamber, in the civil wars, her mother had married Isaac Penington of Chalfont, in Bucks, a minister and writer among the Quakers. In 1677, in company with George Fox and Robert Barclay, the celebrated apologist, he again set sail on a religious visit to Holland and Germany, where he and his friends were received by many pious persons as the ministers of Christ, particularly at Herwerden, by the Countess Palatine Elizabeth, grand-daughter of James I. of England.

The persecutions of Dissenters continuing to rage, notwithstanding their repeated applications to Parliament for sufferance and protection, William Penn now turned his thoughts towards a settlement in the New World, as a place where himself and his friends might enjoy their religious opinions without molestation. He therefore, in 1681, solicited a patent from Charles II. for a province in North America, which the king readily granted, in lieu of the debt still due him from the crown. Penn soon after published a description of the province, proposing easy terms of settlement to such as might be disposed to go thither. He wanted to name the territory Sylvania, on account of its forests, but Charles II. good-humouredly insisted on the founder's name being prefixed. He also wrote to the Indian natives, informing them of his desire to hold his possession with their consent and good-will. He then drew up the Fundamental Constitution of Pennsylvania, and the following year he published the Frame of Government, a law of which code held out a greater degree of religious liberty than had at that time been allowed in the world. 'All persons living in this province, who confess and acknowledge the One Almighty and Eternal God to be the Creator, Upholder, and Ruler of the world, and that hold themselves obliged in conscience to live peaceably and justly in civil society, shall in no wise be molested or prejudiced for their religious persuasion or practice, in matters of faith and worship; nor shall they be compelled at any time to frequent or maintain any religious worship, place or ministry whatsoever.' Upon the publication of these proposals many respectable families removed to the new province; the city of Philadelphia was laid out upon the banks of the Delaware; and in 1682 the proprietor visited his newly-acquired territory, where he was joyfully welcomed by the settlers, and on the 30th November held the famous conference with the native tribes under the elm-tree at Shackamaxon (now Kensington). He remained in the province about two years, adjusting its concerns, and establishing a friendly intercourse with his colonial neighbours; during which period no less than fifty sail arrived with settlers from England, Ireland, Wales, Holland, and Germany.

Soon after Penn returned to England King Charles died; and the respect which James II. bore to the late admiral, who had recommended his son to his favour, procured to him free access at court. He made use of this advantage to solicit the discharge of his persecuted brethren, 1500 of whom remained in prison at the decease of the late king. In 1686, having taken lodgings at Kensington, to be near the court, he published a Persuasive to Moderation towards Dissenting Christians, &c., humbly submitted to the king, which is thought to have hastened, if it did not occasion, the proclamation for a general pardon, and the repeal of religious tests and penalties. At the Revolution in 1688 Penn's intimacy with the abdicated monarch created suspicions, of which he repeatedly cleared himself until he was accused by a profligate wretch, whom the Parliament afterwards declared to be a cheat and an impostor. Not caring to defend himself against the unfounded assertions of such a man, he withdrew from public notice till 1693. In that year, through the mediation of his friends at court, he was once more admitted to plead his own cause before the king and council, and was again acquitted of all suspicion of guilt. The most generally known production of his temporary seclusion bears the title of Fruits of Solitude, in Reflections and Maxims relating to the Conduct of Human Life. Not long after his restoration to society he lost his wife Gulielma. He travelled the same year in the west of England, and in the next prosecuted an application to Parliament for the relief of his friends the Quakers, in the case of oaths. In the year 1696 he married a second wife, Hannah, the daughter of Thomas Callowhill, an eminent merchant of Bristol, and soon after buried his eldest son, Springett. In 1698 he travelled in Ireland, and resided the following year at Bristol. In 1699 he again sailed for Pennsylvania, with his second wife and family, intending to make his province the place of their future residence; but advantage was taken of his absence to undermine proprietary governments, under colour of the king's prerogative, and he returned to England again in 1701. He left the management of

from the south, in order to form the Ohio. The climate in the south-east is subject to frequent and sudden fluctuations; in the north, among the mountains, it is more settled, but often in winter very keen; and to the west of the Alleghanies, owing chiefly to the prevalence of south-east winds, is milder than toward the east. The transition from summer to winter is decidedly marked, but spring is short, fickle, and uncertain. Autumn is the pleasantest season, and though sometimes oppressive from excessive heat is for the most part serene and beautiful. The thermometer at Philadelphia ranges from 6° to 98°, and at Pittsburg from 10° to 94°. The variations of the climate do not impair its salubrity, and Pennsylvania is one of the healthiest states of the Union. The soil has various grades of fertility, but is in general well adapted for agricultural operations. The richest and most highly cultivated tract is south-east of the mountains on both banks of the Susquehanna. The most important crops are Indian corn, oats, wheat, rye, and buckwheat, the produce in 1880 being Indian corn, 45,821,531 bushels; oats, 33,841,439; wheat, 19,462,405; rye, 3,683,621; and buckwheat, 3,593,326. Potatoes and tobacco are largely grown, and flax more partially. Live stock, including oxen, cows, sheep, and swine, are abundant, and large quantities of dairy produce are obtained for export. Next in importance to agricultural are the mineral products of the state, coal, iron, and salt occurring in almost exhaustless abundance. In the whole of the mountain districts of the south and east to the west of the Susquehanna an anthracite coal-field occurs over an area estimated at 472 square miles; while to the west of the Alleghanies a vast bituminous coal-field, of which Pittsburg may be considered the centre, has been traced over an area of 12,302 square miles. In 1882 the coal produced was 29,000,000 tons of anthracite and 22,000,000 tons bituminous. The coal strata of both these fields contain many valuable seams of ironstone, and both the smelting and working of iron have long been regarded as the most important interest of the state. In 1882 about 2,500,000 tons of pig-iron were produced. But a recent accession of immense value has been the discovery of petroleum, which has been found to exist in enormous quantities in the north-west, in Venango, Clarion, Crawford, and Warren counties, as well as the south-western counties of Fayette and Green, and in many other places. The deposits lie from 300 feet to 1200 feet below the surface; and in some instances the oil, when tapped by borings, spouts upwards to a considerable height, but gradually exhausts itself; in other cases it is obtained by pumping from wells. There are important manufactures of woollen and cotton goods; that of maple-sugar also is extensively carried on. Both the foreign and inland trade have been largely developed. The inland trade has been greatly promoted by important works of internal improvement, more especially railroads, forming a complete network in the eastern portion, and thence west across the centre of the state. At the end of the year 1882 there were 6792 miles of railway open for traffic. The canals, which formerly extended over 1000 miles, have been greatly abandoned except for the transport of coals and other heavy traffic, in consequence of the rapid development of the railway system. The largest religious denominations are, first, the Methodists; then the Lutherans, Presbyterians, German Reformed, and Baptists; and, lastly, the Episcopalians, Roman Catholics, Congregationalists, and Quakers. The principal cities and boroughs have high and graded schools, and in a number of the towns some amount of free industrial and technical training is provided for. Education is not compulsory. The higher educational establishments are chiefly the Philadelphia University, the Western University at Pittsburg, Dickenson College, at Carlisle, Jefferson, Alleghany, and several other colleges. The legislature, chosen by universal suffrage, consists of a senate of fifty members elected for four years, a third retiring annually; and a house of representatives of 200 members elected for two years. The state is divided into sixty-seven counties. Harrisburg, though an insignificant place compared with Philadelphia, and even with Pittsburg, continues to be the capital. The first settlement in the state was made by a company of Swedes in 1638. The Dutch afterwards gained possession, but it was wrested from them by the English in 1664. A subsequent settlement was made in 1681 by the celebrated Quaker William Penn, from whom the state has derived its name. In 1800 the population was 602,361; in 1820 it was 1,049,458; in 1880 it reached 4,282,891.

PENNY, a British coin and money of account, the twelfth part of a shilling. It was at first a silver coin weighing about 22½ grains troy, or the two hundred and fortieth part of a Saxon pound. It is mentioned in the laws of Ina about the year 695. Till the time of Edward I. the penny was so deeply indented by a cross mark that it could be broken into halves (thence called halfpenny) or quarters (fourthings or farthings). Edward I. reduced the weight of the penny to a standard, ordering that it should weigh the twentieth part of an ounce. It however steadily decreased in weight; it was 18 grains under Edward III., 8 grains under Edward VI., and at last, in the reign of Elizabeth, it was fixed at $7\frac{2}{3}\frac{3}{1}$ grains, or the sixty-second part of an ounce of silver. This proportion was observed up till the introduction of the bronze coinage in 1860. The intrinsic value of the bronze penny is about half of that of the old copper coin. Copper pennies were first coined in 1797.

PENNYROYAL, a species of mint (*Mentha pulegium*) formerly in considerable repute as a medicine, but now almost totally neglected. See MINT.

PENOBSCOT, the largest river of Maine, United States of America. It is formed by two branches, the East and the West, which unite near the centre of the state, 54 miles north-east of Bangor. After the junction it runs south by west till it flows into the head of Penobscot Bay, between the towns of Penobscot and Prospect. It is navigable for ships to Bangor, where the tide terminates, 52 miles north of Owl's Head, at the entrance of the bay. Its length from the junction is about 135 miles, or, measuring from the source of the principal branch (the West), 300 miles.

PENRITH, a market town of England, in the county of Cumberland, 17 miles south by east of Carlisle, is a station on the Lancaster and Carlisle Railway, and overlooked by the ruins of an ancient castle. The houses are generally well built of red sandstone, and it has two churches, one of which is of recent erection and remarkably handsome; two Methodist chapels, Primitive, Independent, Presbyterian, and Roman Catholic chapels, and several schools, including a free grammar-school. Near the railway-station are the ruins of an ancient castle, and in the churchyard two monuments said to belong to Anglo-Saxon times. Penrith, which stands on the outskirts of the Lake district, is often visited by tourists, and contains several very good hotels. The district is purely agricultural. Pop. of urban sanitary district in 1871, 8317; in 1881, 9268.

PENRYN, an ancient municipal and parliamentary borough, market town, and seaport, England, in the county of Cornwall, 2 miles north-west of Falmouth, at the head of a branch of Falmouth harbour. It has a town-hall and market-house; a church, places of

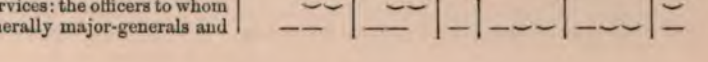
worship for various Dissenting bodies; a free grammar and National schools; a library and news-rooms. The port is included in that of Falmouth, and has a considerable trade in exporting granite, which is worked a few miles from the town. The manufacture of paper, woollen cloth, arsenic, and gunpowder is carried on, and in the vicinity are some tanneries, breweries, and corn-mills. Pop. in 1881, 3466.

PENSACOLA, a port of entry and capital of Escambia county, Florida, United States, is situated on a bay of the same name. The plan of the town is regular and the streets wide. It suffered considerably in 1861, during the American civil war. Vessels drawing 21 feet can approach the town, and the bay is one of the safest and most capacious in the Gulf of Mexico. It has been selected as a naval station and depot, and is well defended by several strong forts. Pop. (1881), 6845.

PENSIONS AND PENSIONERS, CIVIL, MILITARY, and NAVAL. 1. *Civil.*—In Great Britain pensions given as matters of mere political favour were, down to about the end of the last century, one of the commonest instruments of parliamentary government, but with very few exceptions the usage has now been abandoned. The only pensions of this nature still conferred are those payable to certain ministers of state, &c., on retirement after a number of years' service, and those smaller sums paid from a parliamentary grant of £1200 annually, intrusted to the queen 'for the payment of pensions to persons who have just claims on the royal beneficence, or who by their personal services to the crown, by the performance of duties to the public, or by their useful discoveries in science, or attainments in literature and the arts, have merited the gracious consideration of their sovereign and the gratitude of their country.' The pensions to ordinary civil servants of the crown, which until lately were made up by deductions from annual salary, are more commonly called superannuation allowances, and are regulated by several statutes, the most recent of which are 20 and 21 Vict. cap. xxxvii.; 22 Vict. cap. xxxvi. 2. In the *army* pensions are allowed to non-commissioned officers and soldiers who have served twenty-one years in the infantry or twenty-four years in the cavalry, or earlier if they are compelled to quit the service by ill health, wounds, or reduction of force. The amount is fixed according to individual merits by the commissioners for Chelsea Hospital, and ranges from 3*s.* 10*d.* to 1½*d.* a day, the lower rates being chiefly confined to negro pensioners from regiments serving in the tropics. In-pensioners are soldiers quartered at Chelsea and Kilmainham Hospitals, who, instead of their ordinary pensions, are fed and clothed by government, and receive a small allowance for pocket-money. The total charge for both hospitals for the year 1883–84 was set down at £33,377. The out-pensioners draw their pensions, live where they please, and frequently follow other pursuits, often with considerable success, the habits of order and punctuality acquired in the army qualifying them for such situations as time-keepers, railway signal-men, guards, volunteer instructors, &c. Pensioners in good health may, if so inclined, enter a force called the Enrolled Pensioners, belonging to the army of reserve. For this they receive annually a sum of £1, besides pay during the yearly eight days' drill, amounting to 2*s.* a day for privates, 2*s.* 6*d.* for corporals, and 3*s.* for sergeants. A pension is forfeited if the holder be convicted of felony. The number of out-door pensioners in 1883 was above 83,600; amount of pensions, £1,758,900. Pensions entitled 'rewards for distinguished services,' are granted to officers in consideration of meritorious services: the officers to whom they are rewarded are generally major-generals and colonels, in which case they amount to £100 each; but a few quarter-masters and subalterns receive these annuities, which in their case rarely amount to £100. In 1883–84 the amount paid as rewards for distinguished services was £22,800. This includes pensions to the amount of £850 granted with the Victoria Cross, for especial bravery in action. 3. *Naval* pensions are given to petty officers, seamen, and marines, under principles essentially similar to those for the army, with the exception that since 1865 there are no in-pensioners. In 1883–84 the sum of £592,247 was paid as pensions to 24,060 seamen and marines. Besides this sum there were distributed £6400 as pensions for meritorious service, in amounts of £300 annually to flag-officers, £150 to captains, and in various amounts to marine, medical, and other officers. The pensions for conspicuous bravery amounted to £230; for flag-officers' retired pensions, £300; to engineers, warrant officers, &c., 963 in number, £83,500. Pensions for wounds are common to both services, but are restricted to officers, although, as already mentioned, wounds may hasten or augment the pensions of common soldiers and sailors. They are awarded respectively by the secretary for war and the lords of the admiralty for serious bodily injury, as the loss of a limb or eye, and vary according to the rank of the officer and other circumstances. In case of less serious injury temporary pensions or gratuities are awarded. The charges for pensions for wounds in 1883–84 were: army, 142 recipients, £15,000; navy, 74 recipients, £7600. Widows of commissioned and warrant officers in the army and navy receive pensions as long as they do not remarry, provided they have been married a year previous to the death of their husbands, that they were not twenty-five years younger than their late husbands, and that the deceased officers were under sixty years (fifty for warrant officers) at the date of the marriage. A widow is disqualified if she be left in wealthy circumstances or is guilty of immoral conduct. Should she remarry, the pension is suspended, but may be revived upon the death of her second husband. The amount varies according to the rank or relative rank of the officer, there being also three rates attached to each rank—first, should he be killed in battle; second, should he die from illness contracted on the field; third, should he die under ordinary circumstances. In 1883–84 the widows' pension-list for the army amounted to £120,000; for the navy, £142,400. Besides these pensions there are small sums granted under the name of compassionate allowances to the children of deceased officers left in narrow circumstances; they range from £5 to £40 each, and are tenable in the case of boys until the age of eighteen, unless earlier provided for, and in the case of girls until twenty-one, unless earlier married. The charges for these purposes in 1883–84 were, for the army, £21,700; for the navy, £22,500. Should an officer die without leaving a wife or children, his mother or sisters are entitled to an allowance provided it can be proved that they were dependent upon him for support. In the same year pensions granted to persons in the coast-guard amounted to £43,600.

PENTAGRAPH. See PANTOGRAPH.

PENTAMETER, in Latin prosody, a verse consisting of five feet, or more properly of four feet with two syllables of broken feet. These feet are two spondees or dactyles followed by a long syllable, and two dactyles followed by a long or short syllable. The scheme of the pentameter is therefore as follows:—



PENTATEUCH, the Greek name applied to the first five books in the Bible, called also the Law of Moses (Hebrew, *Torath Mosheh*), or simply the Law (*Torah*); its rabbinical title is *Chamisha Chumshe Torah* (five-fifths of the Law). The division of the whole work into five parts has by some authorities been supposed to be original; others, with more probability, think it was so divided by the Greek translators, the titles of the several books being Greek, not Hebrew. The Hebrew names are simply the first words of each book, and originally designated particular sections rather than whole books. For the contents of each book see our articles on GENESIS, EXODUS, LEVITICUS, NUMBERS, DEUTERONOMY. Here we can only briefly state that this work begins with an account of creation and the primeval condition of man, of the entrance of sin into the world, and God's dealing with it, broadening out into a history of the early world, but again narrowing into biographies of the founders of the Jewish family; it then proceeds to describe how the family grew into a nation in Egypt, tells us of its oppression and deliverance; of its forty years' wandering in the wilderness; of the giving of the law, with all its civil and religious enactments; of the construction of the tabernacle; of the census of the people; of the rights and duties of the priesthood; and concludes with the last discourses of Moses and his death. The unity of the work in its present form is generally recognized. It is not a mere series of loose fragments thrown carelessly together at various times, but offers strong evidence of design and purpose in its composition. Even those who adopt the theory that different writers were engaged upon the earlier books, and who deny that Moses wrote Deuteronomy, are still inclined to believe that the Pentateuch, as we possess it, is a connected whole, and was reduced to that form by a single reviser. Until nearly the end of last century the conviction among the Jews and Christians that Moses wrote the complete work, with the exception of the last chapter or so of Deuteronomy, ascribed to Joshua, might be said to have been universally adhered to. There have been certainly at different periods doubts expressed as to its authenticity. It was assumed as early as the second century by the pseudo-Clementines that the law had been orally delivered by Moses to the elders, that before and after it was committed to writing it had suffered considerable corruption, and that it was especially filled with false anthropomorphic conceptions of the Deity, and ignoble representations of the characters of the patriarchs. Jerome expresses himself in a doubtful manner on the relation of Ezra as the reviser or restorer of the Pentateuch. Aben Ezra of Toledo (about 1093–1168) hinted that some passages had not come from the hand of Moses, and mentions others as mysteries which it was beyond his power to explain in consonance with the popular belief. Carlstadt, for some time Luther's associate, admitted that Moses received the law from God, but doubted whether the words and thread of discourse in the Pentateuch did not proceed from some later writer, though he rejected the notion that Ezra was this writer. Masius, a Roman Catholic, whose commentary on Joshua was published in 1574, after his death, held that Ezra or some other inspired person did subject the work to revision. It was not until long after the Reformation, however, that the question whether the Pentateuch was the work of one man or of one age, and what share Moses had in its composition, began to be discussed seriously and upon scientific grounds. Spinoza, in a work published in 1679, maintained that Moses issued his commands to the elders, who transcribed them and communicated them to the people; that they were afterwards collected and assigned to suitable passages in the life of Moses; and that we owe the present form of the work to Ezra. He was followed by Vitringa, Le Clerc, Simon, and others, who continued and extended the discussion, chiefly respecting the difficulties engendered by conflicting accounts of the creation and other incidents contained in the first book. The next and most important step, removing the question from the region of vague speculation to the scientific basis on which it still rests, was taken by Dr. Astruc in his work Conjectures sur les Mémoires Originaux, dont il paroît que Moyse s'est servi pour composer le Livre de Genèse. He ingeniously suggested that different documents which Moses had wrought up (or rather placed together, and which transcribers had intermingled) might be disentangled by observing their use of the divine names, Elohim and Jehovah. This 'documentary theory' gave way to the 'fragmentary theory' of Vater (1815) and Hartmann (1818), who maintained that the Pentateuch was merely a collection of fragments thrown together without order or design. Vater supposed a collection of laws made in the reigns of David and Solomon to have been the foundation of the whole; that this was the book discovered in the temple by Hilkiah in the reign of Josiah, and that its fragments were incorporated in Deuteronomy. All the rest, made up of fragments of history and laws written at various periods up to this time, were collected and moulded into their present form between the times of Josiah and the Babylonish exile. This theory has now lost its popularity by the substitution of another, called the 'supplementary hypothesis,' whose leading principle is that there was only one original or fundamental document (the Elohistic) giving a connected history from first to last, such as we have in the Pentateuch; but that a later editor (the Jehovist), or several successive editors, enlarged it to its present extent, sometimes very greatly, by the insertion of additional matter from other sources, whether these had appeared in a written form already, or whether they were still floating in the minds of the people as traditions. The discussions on these points, which until recently were mainly led by German theologians, have now been taken up by English biblical critics, among the earliest being Dr. Davidson, Bishop Colenso, and the writers of the celebrated Essays and Reviews, who dispute the authenticity of the entire work; and by a host of more or less able champions, who almost unanimously contend that, with the exception perhaps of the concluding verses of Deuteronomy, Moses was the undoubted author of every line. All we can do here is to sum up as briefly as possible the leading arguments on either side, referring the reader desirous of further investigating the subject to the works mentioned at the close of this article.

Those who deny the integrity of the Pentateuch maintain that were it the production of one author it should bear unmistakable evidence of a plan and unity, that it ought to be free from useless repetitions of great length, and of contradictions and anachronisms. Yet the fragmentary character of the work, they hold, is plainly apparent. Numerous portions, evidently complete in themselves, are thrown together without regard to logical sequence or chronological order. As to repetitions and contradictions, we have an instance at the very outset in the two different accounts of the creation found in the first and second chapters of Genesis, in each of which accounts, too, the divine name is mentioned throughout in a different way. So also is the case with the account of the flood (compare the Jehovistic sections, Gen. vi. 5, 7; vii. 1–5, with the Elohistic, vi. 9, 12, 13, 19, 20, 17, 22; vii. 7–10). The same is to be said with regard

to several incidents in the lives of the patriarchs, the descriptions of the tabernacle; the sacerdotal robes; the story of the manna as given in Exod. xvi. and Num. xi.; the account of the appointment of the council of the seventy elders in the same books, &c. As instances of anachronisms are given Gen. xxxvi. 31, which must have been written after the election of Saul as king; Gen. xiv. 14; Deut. xxxiv. 1, in which is mentioned the name of the city of Dan, only so called after its occupation by that tribe; Num. xxxii. 34–42, containing a list of towns built by the tribes of Reuben and Gad, which could have had no existence in Moses' time; Deut. x. 8, and other passages where the words 'up to this day' occur. Again, it is highly improbable that Moses should describe himself as the meekest of men, as is done in Num. xii. 3, or write the history of his own death. It is further argued that the language of the Pentateuch is almost identical in form with that of the later prophets, and that it is very unlikely that there should be no very sensible change in the idiom in the course of a thousand years. The arguments of the rationalists against miracles are also used against the Pentateuch, which contains records of events contradictory to natural laws as established in the united experience of the human race. On the other hand, the writers of the conservative or orthodox school maintain that the Pentateuch has a unity of plan, a coherence of parts, a shapeliness, and an order which should convince every unprejudiced mind that it is the production of a single author. The history contained in Genesis could not of course be written by Moses from personal knowledge; but whether he was taught it by immediate divine suggestion, or was directed by the Holy Spirit to the use of earlier documents, is immaterial in reference to the inspiration of the work. The language of our Lord is such that the hypothesis of the Pentateuch not being the inspired work of Moses must create a very painful feeling in the mind of every true follower of Christ. Compare Matt. xv. 1–9; xix. 4, 5; xxii. 24; Luke xxiv. 27, 44, 45, and particularly John v. 46, 47, besides numerous other passages wherein either quotations are made from the several books, or allusion made to the law and the writings of Moses as being of divine authority. It is admitted that various passages may have been interpolated by way of commentary or note in post-Mosaic times by inspired persons, as Ezra. As to the argument from the language, it is said that the Pentateuch, embodying as it does the very phrases used by the Almighty, became the model of literary Hebrew for the succeeding thousand years; that the priests and Levites, the instructors of the people, were commanded to read and study it. That Deuteronomy differs in style and manner from the earlier books is explained by the lawgiver's advanced age, or the impressive and poetic tone he wished to give to his last utterances. The events which are not in harmony with natural law are accepted by one section of the conservative party as miracles, the intervention of God on behalf of his chosen people; while another section who contend for the authenticity endeavour to give a sort of poetical interpretation for them. There are numerous indications that the work was written by Moses, such as the prominence given to many events, and the minuteness and vividness of the descriptions, so peculiar a feature in the narratives of eye-witnesses and men personally engaged in the transactions, with which may be associated the evidence of intimate but not obtruded acquaintance with Egypt and the wilderness.

Among the most recent important arguments against the authenticity of the Pentateuch are those founded chiefly upon arithmetical grounds. The numbers of the Israelites, their herds, &c., at different periods, do not conform to the laws of natural increase, or even to the limits of the territory within which they were at times stated to have been confined. These arguments have been met with more or less success in various ways. The extraordinary increase is explained in some of the difficult cases by miraculous interference. Corruptions, interpolations, and the many accidents to which very ancient books are liable, are admitted by some of the conservative school to have had some influence on the modification of the text; but by the writers of the extreme section of that party, who contend that a special providence preserved the work from all profane tampering, this argument is of course given up. We subjoin a short list of the names of commentators and writers on the Pentateuch:—Against the Mosaic authorship: De Wette, Bleek, Dr. S. Davidson, Ewald (Geschichte des Volkes Israel), Vaihinger (article Pentateuch, in Herzog's Encyclopädie), Stähelin, Colenso. In its favour: Hengstenberg, Hävernick, Ranke (Untersuchungen über den Pentateuch), Drechsler (Die Einheit und Echtheit der Genesis). A somewhat peculiar position is assumed by Delitzsch in his Commentary on Genesis, and by Kurtz in his History of the Old Covenant.

PENTECOST (from the Greek *pentēkostē*, the fiftieth), a Jewish festival, held on the fiftieth day after the passover, in celebration of the ingathering and in thanksgiving for the harvest. It was also called the *Feast of Weeks*, because it occurred at the end of a week of weeks, or seven weeks. It is also a festival of the Christian church, occurring fifty days after Easter, in commemoration of the descent of the Holy Ghost on the disciples. It is called *Whitsuntide* by the English, according to some from *White Sunday Tide* (time), because those who were newly baptized appeared at church in a white dress between Easter and Pentecost.

PENTHIÈVRE, an ancient county of Brittany, now forming the French department of Morbihan, belonged in earlier times to several branches of the house of Brittany, but at a later period came to the houses of Brosse and Luxembourg, and in 1569 was erected in their favour by Charles IX. into a dukedom. It afterwards fell to the crown, and was given, in 1697, by Louis XIV. to one of his illegitimate sons by Madame de Montespan, the Count of Toulouse, who died in 1737. His only son and heir was Louis Jean Marie de Bourbon, duke of Penthièvre, born in 1725, and distinguished for the purity of his morals and great integrity. He also inherited from his father the office of high admiral, the government of Brittany, and the colonelcy of two regiments which bore his name, and at whose head he fought bravely in the battles of Dettingen and Fontenoy. After the Austrian war of Succession he retired to his castle of Sceaux, and devoted himself entirely to works of utility and benevolence. His wife, Maria Theresa of Modena, died in 1754, and in 1768 he lost his son by an accident. His blameless life was so well known that, during the revolution, the Terrorists left him undisturbed, though his heart was torn by the atrocious murder of his daughter-in-law, the Princess of Lamballe. He died at Verona in 1793, four weeks before the convention decreed the arrest of all the Bourbons, and left a daughter, the wife of the Duke of Orleans, better known by his assumed name of Egalité, and the mother of Louis Philippe, king of the French.

PENTLAND FIRTH, a channel separating the mainland of Scotland from the Orkney Islands. It is about 17 miles long, east to west, and 6 to 8 miles broad. A current, setting from east to west, flows through it with a velocity of 3 to 9 miles, causing

many eddies and whirlpools, and rendering its navigation more dangerous than that of any other portion of the Scottish seas. At its east extremity are the Pentland Skerries, two small islets, and several adjacent rocks, which were formerly the scene of numerous shipwrecks. On the larger of these, about 4½ miles north by east of Duncansby Head, is a lighthouse, with two fixed lights 100 feet apart—the one 170 feet and the other 140 feet high; lat. 58° 41′ 12″ N.; lon. 2° 55′ W.

PENTLAND HILLS, a range, Scotland, in the counties of Edinburgh, Peebles, and Lanark, commencing 4½ miles south by west of Edinburgh, and extending south-west for about 16 miles. The highest summit, East Cairn, about the centre of the range, is 1840 feet above sea-level.

PENUMBRA. When an opaque body is illuminated by a luminous point it throws a well-defined shadow—that is, if the body is between the luminous point and a screen the illuminated part of the screen is separated from the dark portion by a line. The illuminated part of the body is separated from the dark part by a line. But if the source of light is a luminous body there is a part of the screen which, although receiving rays from some parts of the luminous body, does not receive so many as if the opaque body were removed; this part of the screen is in the penumbra or partial shadow. An eye placed in the penumbra would see part of the luminous body, part being eclipsed by the opaque body; an eye placed in the 'umbra,' or place of total shadow, would receive no rays from the luminous body; an eye placed anywhere else than in the penumbra and umbra sees the luminous body without eclipse. If the luminous and opaque bodies are spheres, a double cone, touching both, stretching behind the opaque body, is the outer boundary of the penumbra, the shadow is less and less at places nearer and nearer this boundary; another cone touching both bodies, stretching behind the opaque body, bounds the umbra, all points within it being in total shadow. Thus, on a screen, the umbra would be indicated by a perfectly dark circular space; portions farther and farther outside this circle are more and more illuminated till complete illumination is reached beyond the circle of the penumbra. The umbra and penumbra show themselves on the opaque body, the regions farthest away from the source of light being in the umbra, the zone bounded by the lines of contact of the two cones being the penumbra.

PENZA, a government in Russia, bounded north by Nijnei-Novgorod, west by Tambov, south by Saratov, and east by Simbirsk; area, 14,996 square miles; pop. 1,337,155. Its surface, though generally flat, is intersected by some low hills separating the basins of the Don and Volga, the latter of which receives the far larger share of the drainage indirectly. The climate is mild, and the soil fertile in corn, hemp, and flax. Tobacco and hops are also extensively cultivated. The forests are extensive, and are much used in smelting the iron ores, in which the government is rich. Millstones are extensively quarried. The chief exports are corn, flour, spirits, leather, soap, wax, honey, potash, wool, and timber; but the commercial development of the province is greatly retarded by want of direct communication with the best markets.

PENZA, the capital of the above government, is beautifully situated on an eminence at the junction of the Penza and Soura. It was founded in 1666, as a defence against Tartar incursions, and consists of an old town with wooden houses, and a new town with many fine mansions and houses, and handsome churches standing in the centre of large open squares. In the town are numerous beautiful gardens, a large park, and a horticultural school. It possesses cloth-factories, iron-works, tanneries, soap-boiling and candle-making establishments, &c. Pop. 35,026.

PENZANCE, a municipal borough and seaport of England, in the county of Cornwall, picturesquely situated on the north-west of Mount's Bay, on a finely-curved shore, bordered by rocky heights, 26 miles south-west of Truro. Besides three elegant parish churches, it has various Dissenting chapels, a handsome town-hall, market-house, and custom-house; a grammar and other schools; a geological society with a valuable collection, a public library, and other scientific or literary institutions. At the harbour, consisting of two piers, with a lighthouse at the extremity of the southern one, there is a large export of tin and copper, china-clay, and pilchards. Two additional piers and a floating dock are being constructed. The town was burned to the ground by a band of Spanish marauders in 1595, and was sacked by Fairfax in 1646. Pop. in 1881, 11,684.

PEONY (*Pæonia*), a genus of plants belonging to the natural order Ranunculaceæ, distinguished for the magnificence of the flowers. The species are herbaceous, or very rarely shrubby, having perennial, tuberous roots, and large leaves, which are more or less divided. The flowers are solitary, and of a white or purplish colour. Several are cultivated in gardens, where they are very conspicuous, especially when the flowers are double.—The Common Peony (*P. officinalis*) grows from 10 to 20 inches in height. The leaves are bi- or tri-ternate, and the flowers are disposed at the extremity of the branches, are very large, and ordinarily of a fine red colour. The double variety, which is now so common everywhere, when introduced at Antwerp, about the end of the sixteenth century, sold for twelve crowns a root. This plant is a native of the mountains of the south of France, Spain, and Siberia. It was celebrated among the ancients, who attributed to it various marvellous properties, but has now lost all such reputation. The Tree Peony (*P. moutan*), in Britain, is not usually more than 3 or 4 feet high, but in China, its native country, is said to reach 10 feet. Fortune mentions that he saw a plant near Shanghai which produced from 300 to 400 flowers annually. It was discovered in the mountains of Honan about the year 400, but did not attract the attention of the Chinese till two or three centuries after. When once known, its culture spread with rapidity, and large sums of money were sacrificed to procure fine varieties. For more than a thousand years it has been generally cultivated by the Chinese, who plant it in the open air, and take unwearied pains during its growth, protecting it from the dust, high winds, and heavy rains by means of tents, and dispensing the heat and light of the sun at their pleasure. They have varieties of all colours—white, yellow, red, purple, violet, blue, and even black. The most common variety cultivated in Great Britain and the United States has superb flowers of a clear red or rose colour, and from 5 to 7 inches in diameter, which, besides, diffuse a very agreeable odour. It is hardy enough to bear our winters, but does not flower in such perfection as when protected. A rich light soil is best adapted to it; and ripened cuttings, planted in a shady place, will take root freely.

PEPERINO, the Italian name for a volcanic rock composed of sand, scoriæ, cinders, &c., cemented together. It is so named from the small peppercorn-like fragments of which it is composed. It seldom possesses much solidity, though it is sometimes employed in building, especially in the environs of Rome. According to its colour it is divided into gray, brown, and red. Pozzolana, famous for its use as a cement, is a species of peperino. The Tarpeian

Rock is composed of red peperino, the catacombs of Rome are the hollows of old quarries dug in it, and Pompeii and Herculaneum lie buried under it.

PEPIN, the name of two distinguished Frank captains of the eighth century, under the last kings of the Merovingian dynasty.—1. PEPIN OF HERISTAL, major-domo at the court of Dagobert II., was, after the death of the king, appointed Duke of the Franks, and under a feeble regency ruled the kingdom with almost despotic sway. The glorious result of several wars consolidated his power, which his valiant son, Charles Martel, who succeeded him, was not only able to maintain, but so to extend that his two sons, Karloman and Pepin the Younger, were able to share the kingdom between them.——2. PEPIN THE YOUNGER, or THE SHORT, just mentioned, after his brother entered a monastery in 746, became sole ruler, and after the deposition of Childeric III. in 752, by agreement with the pope, was proclaimed King of the Franks. Shortly after, Pope Stephen II., pressed by the Longobards under Astulf, applied to France for aid, and by a visit paid to Pepin induced him to proceed with an army to Italy, where he signally defeated the Longobards, and made the pope a present of the lands which he had conquered from them. These lands thus formed the first nucleus of the Papal States. After a second expedition to Italy, to which he was compelled by the treachery of the Longobards, he defeated the Bavarians, warred successfully with the Saxons, and became the founder of the Carlovingian dynasty, being succeeded at his death in 768 by his son, Charles the Great, usually called Charlemagne.

PEPPER (*Piper*), a genus of plants belonging to the natural order Piperaceæ. The species are mostly succulent, perennial, herbaceous, or shrubby, often climbing, with jointed stems. The leaves are simple, sometimes peltate, smooth, and opposite or verticillate. The flowers are disposed in nearly filiform aments, are destitute of either calyx or corolla, and are separated by very small scales; these aments or spikes are opposite to the leaves, or terminal. The fruit consists of a berry containing a single seed. The woody tissue of the pepper-plant is disposed in the stem in wedges instead of concentric rings. The species of pepper are almost strictly confined within the limits of the tropics in Asia and America. A single species has been discovered in East Florida, inhabiting as far north as lat. 39°.

The *Piper nigrum*, which furnishes the black pepper of commerce, is a native of the East Indies, where it is cultivated on an extensive scale. It is a climbing plant, and is supported on a pole or small tree planted for this purpose, which gives to the pepper-grounds an appearance somewhat similar to the hop-fields in northern climates. The stems are smooth and spongy, provided with broad, ovate, acuminate, seven-nerved leaves, and bearing little globular berries, which, when ripe, are of a bright red colour. The pepper of Malacca, Java, and especially of Sumatra, is the most esteemed. Formerly the export of this article to Europe was exclusively in the hands of the Portuguese, but it is now open to all nations. Its culture has been introduced into the Mauritius, and thence into Cayenne and other parts of tropical America, where it has succeeded perfectly. Black pepper has always formed an extensive branch of commerce; the ancient Greeks and Romans were acquainted with it, and at the present day no spice is so generally used. White pepper is nothing more than the best and soundest of the berries, gathered when fully ripe, and deprived of their external skin by steeping them in salt water for about a week, at the end of which time the skins burst; they are then dried in the sun, rubbed between the hands, and winnowed to separate the hulls. It is much less pungent than the entire berries.

The *Chavica Betle*, belonging to the same natural order as the peppers, and growing in the same countries, yields the betel-nut, used as a masticatory in India. It stains the saliva of a brick-red colour, and corrodes by degrees the substance of the teeth, but the consumption is, notwithstanding, prodigious, and it forms a very extensive branch of commerce.

The genus *Cubeba* produces the aromatic, pungent fruit named cubebs (*C. officinalis*), which is used medicinally. Several other species supply cubeb-pepper. The spice known as Cayenne pepper is the produce of a species of Capsicum belonging to the natural order Solanaceæ.

PEPPERMINT. See MINT.

PEPPERMINT-OIL. The essential oil of peppermint, prepared by distilling the herbs of *Mentha piperita* with water, contains a hydrocarbon ($C_{10}H_{18}$) called menthene. On standing it deposits a white crystalline substance called menthol, peppermint-camphor, or Japanese camphor, $C_{10}H_{20}O$.

PEPSINE, a white precipitate or yellow viscid mass, forming a peculiar animal principle contained in the gastric juice, and which, in conjunction with acid matter, also contained in that secretion, confers upon it its solvent or digestive powers in regard to certain components of the food, such as albumen, fibrin, casein, and their modifications. One of its especially characteristic properties is its power of coagulating milk, and afterwards acting upon and dissolving the coagulum. It has no such power over fatty and starchy matters. Pepsine is obtained by digesting the mucous membrane of the stomach of a calf or pig in cold distilled water, which is then distilled and sugar of lead added, which throws down to the bottom of the vessel a precipitate consisting of pepsine in combination with lead. This compound is treated with sulphuretted hydrogen gas, which combines with the lead and leaves the pepsine in solution. This solution is then evaporated, and the gummy mass which is left is mixed with a little starch, and constitutes the pepsine of commerce. The pepsine obtained from the calf's stomach is not so highly coloured as that obtained from the pig's stomach, and is not nearly so strong. Pepsine dissolved in wine is sold under the name of pepsine wine, and is recommended in cases of indigestion connected with loss of power and tone of the stomach.

PEPYS, SAMUEL, secretary to the admiralty in the reigns of Charles II. and James II., was born at Brampton, Huntingdonshire, 1632, and educated at Cambridge. He early acquired the patronage of Sir Edward Montagu, afterwards earl of Sandwich, who employed him as secretary in the expedition for bringing Charles II. from Holland. On his return he was appointed one of the principal officers of the navy. In 1673, when the king took the admiralty into his own hands, he appointed Pepys secretary to that office. He was employed under Lord Dartmouth in the expedition against Tangier, and often accompanied the Duke of York in his naval visits to Scotland, and coasting cruises. During the excitement of the Popish plot he was, at the instigation of the Earl of Shaftesbury, committed to the Tower on an unfounded charge of aiding in the design to dethrone the king and extirpate the Protestant religion, but was after some time discharged without a trial, and reinstated in his office at the admiralty, which he held until the abdication of James II. On the accession of William and Mary he published his Memoirs relating to the navy for ten years preceding, and led a retired life from this time till his death in 1703. He was president of the Royal Society for two years. He left a large collection of manuscripts

to Magdalen College, Oxford, consisting of naval memoirs, prints, and five large folio volumes of ancient English poetry, begun by Selden, and carried down to 1700, from which Bishop Percy made numerous selections for his Reliques of Ancient English Poetry. His Diary (begun 1st January, 1659–60, and ending 31st May, 1669, on account of defective eyesight) affords a curious picture of past manners and of the dissolute court of Charles II. It was written from day to day in a sort of shorthand which was deciphered by the Rev. J. Smith, and first published under the editorial care of Lord Braybrooke in 1825.

PERA, a suburb of Constantinople (which see).

PERCEPTION, in mental philosophy, the faculty or peculiar part of man's constitution by which he acquires knowledge through the medium or instrumentality of the bodily organs; the act of apprehending material objects or qualities through the senses. It differs from *self-consciousness* in that it takes cognizance only of objects without the mind. We *perceive* a man, a house, a tree; when we think or feel we are *conscious* of our thoughts and emotions. It is further supposed in perception that the objects of it are present: former objects of perception we can *remember*, but not perceive until they are again present. The perceptive faculty is exercised through the instrumentality of the senses: we see by means of the eye and hear by means of the ear. A person in whom these organs are wanting or defective will not perceive at all, or perceive imperfectly. The impression made on the organs of sense affects the nerves, and by them is conveyed to the brain. The necessity of this communication may be ascertained by experiment: if the nerve appropriated to any organ be cut or tied there is no perception; and the same result is observed in certain disordered conditions of the brain, even though the organs of sense and the nerves duly perform their special functions. Philosophers in all ages have endeavoured to explain the functions of the brain and nerves in connection with perception. It was the opinion of the ancients that the nervous fibres are small tubes filled with an ethereal fluid named animal spirits; that the brain is a gland by which this fluid is secreted, and that by means of it the nerves perform their office. This theory was adopted by Descartes, who minutely describes how all mental operations are accomplished by such agency. Dr. Briggs, Newton's anatomical instructor, proposed a new hypothesis. He contended that the nerves operated by vibrations like musical strings, and thus convey impressions to the brain. Newton himself seems to have favoured a doctrine of this kind, and some of his suggestions regarding it were amplified and defended by Hartley. It is scarcely necessary for us to say that these hypotheses are totally devoid of foundation. A sound theory must assign a real and adequate, not an imaginary, cause for the phenomena which it professes to explain. Who can prove the existence of the animal spirits of the ancients or the vibrations of Briggs? Granting their existence, who can show any correspondence between them and the formation of images in the mind. All that can be affirmed with certainty respecting the means of perception is that, under certain circumstances, that is when an impression is made on the physical organs and conveyed by the nerves to the brain, perception takes place. The impressions so communicated are the occasions of the mind perceiving, but we can assign no reason why it should do so invariably under such circumstances and not under any other, further than that such is the constitution of our nature. Two great disputes are connected with perception, both brought into full prominence by Bishop Berkeley. The first is the origin of our judgments of the distances and real magnitudes of visible bodies. Berkeley maintained, in opposition to the common notions on this subject, that these were learned by experience, and not by the mere act of vision. The second question has reference to the grounds we have for asserting the existence of an external material world, which, according to Berkeley, was connected with the other. Seeing that perception is a mental act, and knowledge is something contained in a mind, what reason have we for believing in the existence of objects apart from our minds? or what is the mode of existence of the so-called external world? See IDEALISM.

PERCEVAL, SPENCER, second son of John Perceval, Earl of Egmont, born 1762, received his education at Harrow and Trinity College, Cambridge, of which he became a member about the year 1775. On quitting the university he studied law. He soon distinguished himself as a sound constitutional lawyer, and obtained a silk gown. In 1801 he become solicitor-general, and in 1802 attorney-general. On the formation of the new ministry in 1807, after the death of Mr. Fox, he was appointed chancellor of the exchequer, and on the death of the Duke of Portland he became premier. In this post he continued till May 11, 1812, when, while in the act of approaching the door of the House of Commons, a person named Bellingham, who had for some time previously presented a variety of memorials respecting some alleged ill-treatment received in Russia, shot him dead with a pistol in the lobby. The assassin, who avowed that he had been waiting with the view of destroying Lord Leveson Gower, the ambassador to the court of St. Petersburg, made no attempt to escape, and was instantly arrested. Although a plea of insanity was set up by his counsel, he was found guilty and executed on the 18th of the same month. Perceval was a keen debater and a fluent and graceful speaker, but was shallow and intolerant, unequal to the task of leading the councils of a great nation.

PERCH, a genus of fishes belonging to the order Teleostei, and included in the section *Acanthopteri veri* of that group. These fishes form the types of the Perch family (Percidæ). Like other members of their section they possess spiny rays in the first dorsal fin, and in the first rays of the remaining fins. The inferior pharyngeal bones are separate and distinct. The scales of the Percidæ are of the ctenoid variety; that is, their hinder margins are cut into a number of comb-like teeth. The operculum, or gill-cover, and pre-operculum are provided with spinous processes. Teeth are borne on the palate and vomer as well as on the jaws. The rays of the branchiostegal membrane number from five to seven. The mouth is large. The infra-orbital bones are of small size. The Perches occur in both salt and fresh water. They are generally of elegant shape, and the body may be more or less brilliantly coloured. The Common Perch (*Perca fluviatilis*, Pl. CIII.–CIV. fig. 12) is the typical species, and a common tenant of fresh-water lakes and rivers. The body is broad, and somewhat flattened laterally. Two dorsal fins of a brown colour exist, the anterior being supported by very strong spines. It is coloured a greenish-brown on the upper parts, the belly being of a yellowish or golden white. The sides are marked with from five to seven blackish bands. The pectoral fins are coloured brown, the ventrals and caudal fin being bright red or vermilion. The average weight is from 2 to 3 lbs., although this size is frequently exceeded. The perch is a voracious feeder, devouring smaller fishes, worms, crustaceans, &c. It can exist out of water for a considerable period, and perches taken from the water have been returned to their native element alive after several hours' absence. The *Perca Italica* (Cuvier) of Italian rivers possesses a shorter body, and wants the dark body-bands of

the Common Perch. The Sander or Continental Perch (*Lucioperca sandra*) occurs in the rivers of Germany and Eastern Europe. It attains a length of 3 or 4 feet. The Ruffe (*Acerina vulgaris*) is also common in British streams. It is of small size, averaging 6 or 7 inches in length, and possesses one continuous dorsal fin. The Ruffe resembles the Perch in its general form. The Sea-perch or Basse (*Labrax lupus*) occurs in plenty on the southern coasts of Britain and in the Mediterranean. It averages 15 inches in length, and is much used as an article of food. The *Serranus cabrilla* and *S. gigas* (Giant Perch, Pl. CIII.–CIV. fig. 11) are also sometimes termed 'Sea-perches.' The dorsal fin in the latter fishes is long and continuous, its front portion being spiny. The Climbing Perch of India (*Anabas scandens*, Pl. CIII.–CIV. fig. 7) belongs to the family Anabatidæ, a group nearly allied to the Mullets. See CLIMBING-PERCH.

PERCHERS, or PERCHING BIRDS. See INSESSORES.

PERCHLORATES and PERCHLORIC ACID. Perchloric acid ($HClO_4$) is prepared by the action of strong sulphuric acid upon potassium perchlorate. Perchloric acid is a colourless, syrupy liquid, resembling sulphuric acid; it is exceedingly easily decomposed, especially when brought into contact with organic matter; if a drop of the pure acid fall on a piece of wood or charcoal, it instantly explodes with great violence. If a small quantity of water be added to the strong acid, white crystals are deposited of the hydrated acid.

The perchlorates have the general formula $MClO_4$, where M represents a monovalent metal, such as potassium or sodium. The potassium salt is formed by the partial decomposition of potassium chlorate by heat, thus $2KClO_3 = KCl + KClO_4 + O_2$.

PERCUSSION, properly a striking or knocking against anything, denotes in medicine that method of investigation which consists in striking gently on the surface of one of the cavities of the body, and then endeavouring to ascertain from the sound produced the condition of the organ lying beneath. It forms a principal branch of modern medical diagnosis. Anatomy teaches how the organs inclosed in the cavities of the body are regularly formed, whether they are firm or loose in their texture, whether they are full or empty of air, whether they are tense or lax, &c.; and, according to these distinctions, a slight stroke will produce variations of sound, as may be ascertained by physical experiments made, not on the body, but on any kind of subject. Thence by a comparison of the sounds emitted on percussion, with the information furnished by physiology as to the position and structure of any particular organ, and by pathology as to the morbid changes to which it is liable, an idea more or less distinct is obtained of the actual condition of the organ, and of the nature and extent of any disease which may be acting upon it. In a technical point of view percussion is either *immediate* or *mediate*. In the former a stroke is given with the ends of the fingers on the part of the body, either bare or slightly covered, which is to be examined; in the latter an intermediate substance, generally an aglet of ivory, called a pleximeter, is placed on the part in question, and the stroke is given on it either by the fingers or by an instrument invented by Winterich, and called a percussion-hammer. The second mode is the better; the other has gone almost out of use. Much depends on the way in which the stroke is given, as its force and elasticity, as well as its direction, have much influence on the sound. Percussion is most frequently used on the chest, as it has hitherto been found most serviceable in diseases of the organs situated within it, but it is also occasionally applied to the cavity of the abdomen, the head, &c. It was first discovered by Avenbrugger, a physician of Vienna, who called attention to it in his tract entitled Inventum novum in percussione thoracis humani ut signo, &c. (Vienna, 1761), and was followed up in France, particularly by Corvisart and Laennec. It has since extended to all the medical schools of Europe. Mediate percussion was invented by Piorry, and it has been carried to the highest perfection by Skoda and his scholars.

PERCUSSION CAPS are small copper cylinders, closed at one end for conveniently holding the detonating composition which is exploded by percussion in certain kinds of fire-arms. The manufacture is extremely simple. Thin rolled copper, as pure as possible, is selected. This is stamped into pieces called blanks, which are then punched up into the required shape. They are then turned mouth upwards in a tray, and the bottom of each touched with a strong adhesive liquid. Before this hardens the fulminating composition is dusted in, and all that does not adhere is blown or shaken out. A stamper is again thrust into the cap to fix and compress the powder, and the operation is completed. Caps for muskets are charged with a detonating powder composed of fulminating mercury and chlorate of potash; for cannon the mixture is 2 parts of chlorate of potash, 2 parts of native sulphuret of antimony, and, to increase the friction, 1 part of powdered glass. The copper cap came into general use between 1820 and 1830, and was introduced into the army in 1840.

PERCY, the name of a noble family who came to England in the train of William the Conqueror, and whose head, WILLIAM DE PERCY, obtained from that monarch thirty knights' fees in the north of England. A descendant, also named WILLIAM, who lived in the early part of the twelfth century, left behind him two daughters, the elder of whom died childless, and the younger, Agnes, married Josceline of Lorain, brother-in-law of Henry V., on condition of his adopting either the surname or arms of Percy. He retained his paternal arms and assumed the surname of his bride. His son, RICHARD DE PERCY, was one of the twenty-five barons who extorted Magna Charta from King John. His great-grandson, HENRY, LORD PERCY, was created Earl of Northumberland in 1337. He was one of Edward III.'s most distinguished commanders, and was Marshal of England at the coronation of his successor, Richard II., against whom, however, he took up arms, and succeeded in placing the crown on the head of the Lancastrian aspirant, Henry IV. He quarrelled also with this king, refusing to give up the Scottish nobles whom he took captive at Homildon Hill, according to the commonly received notion, but in reality hoping to obtain more influence under the new claimant for the throne, Mortimer, earl of March. His forces were beaten at Shrewsbury (1403), where his son, Henry Percy (Hotspur), fell; and again at Barnham Moor (1407–8), where he himself fell. His titles were forfeited, but were revived in favour of his grandson HENRY, who was appointed lord high constable of England, and who fell fighting in the Lancastrian cause at St. Albans (1453). For the same cause his son and successor shared the same fate at Towton (1461). The fourth earl was murdered during a popular rising, caused by his enforcing a subsidy ordered by the avaricious Henry VII. The sixth and seventh earls fell by the hands of the executioner in the reigns of Edward VI. and Elizabeth respectively. The eighth died a violent death in the Tower, where he was confined on a charge of taking part in a plot in favour of Mary of Scotland. ALGERNON, the tenth earl, took part, though not a very active one, in the civil war against Charles I., and afterwards used all his influ-

ence to bring about the Restoration. JOSCELINE, the eleventh earl, died without male issue; his only daughter married Charles, duke of Somerset, and became the mother of ALGERNON, DUKE OF SOMERSET, who was created Earl of Northumberland, with remainder to his son-in-law, SIR HUGH SMITHSON, a Yorkshire baronet of good family. The latter succeeded to the earldom in 1750, and in 1766 received the ducal title. His great-grandson, the present duke, thus represents the female line of the ancient historical house.

PERCY, THOMAS, Bishop of Dromore, in Ireland, a descendant of the family of Northumberland, was born in Bridgenorth in 1728, and graduated at Christ Church, Oxford, in 1753. In 1769 he was appointed chaplain to the king, and in 1778 raised to the deanery of Carlisle, which he resigned four years after for the Irish bishopric of Dromore. The most popular of his works are his Reliques of Ancient English Poetry (in three vols. 8vo), and a poem, the Hermit of Warkworth. The Reliques were obtained chiefly from an old MS. collection of songs and ballads that had come into his possession, together with pieces from Pepys's Collection at Cambridge, the Ashmole Library at Oxford, the British Museum, and the works of the earlier poets. Many of the pieces were retouched, recast, and, when fragmentary, completed, almost always with great taste, but this tampering brought upon the editor the wrath of Ritson and other antiquaries. The work was published in 1765, and materially helped to give a more natural and vigorous tone to our literature, then deeply tainted with conventionalism. He was well skilled in the Icelandic and several of the oriental languages, especially the Chinese, from which he made some translations. His other writings are a Key to the New Testament, a new version of Solomon's Song, with translations of Mallet's Northern Antiquities, and of some pieces of Icelandic poetry. He also published a curious domestic record, long extant in the Percy family, and known as the Northumberland Household Book—a document valuable for the light it throws on manners. His death took place at Dromore, Sept. 30, 1811.

PEREGRINUS PROTEUS, a notorious character, who flourished in the first half of the second century, was born at Parium, in Mysia. After many excesses he was charged with parricide, and was obliged to flee. He went to Palestine, became a Christian, and by his zeal, which brought him to a dungeon, gained the name of a martyr. He received support and sympathy from every quarter, till the prefect of Syria set him at liberty. He now recommenced his wanderings, was excluded from the church for his vices, and then gave himself up to the most disgraceful excesses. An object of universal abhorrence, he desired at least to finish his career in an extraordinary manner. He accordingly gave out that he should burn himself alive at the Olympic games. This he did, in presence of an immense multitude, A.D. 165. Much interest has been given to the history of this singular character by the romance of Wieland.

PEREIRA, JONATHAN, an eminent physician and pharmacologist, was born in London on 22d May, 1804, studied medicine, and passed his examination at Apothecaries' Hall when only eighteen years of age. Almost immediately thereafter he was appointed to the charge of the dispensary, and about the same time opened a class for private medical instruction, which was attended with great success. He composed various elementary pharmaceutical works for the use of his pupils, and in 1826 succeeded Dr. Clutterbuck as a lecturer on chemistry. In 1833 he became professor of chemistry in the London hospital, and for six years gave lectures both there and at the new medical school in Aldersgate Street, on the subjects of chemistry, botany, and materia medica, the last being more especially the branch of medical science which formed his favourite subject of study. His lectures on it diffused his fame over Europe, and were published in 1839, under the title Elements of Materia Medica and Therapeutics, which, like another work issued by him in 1842, on Food and Diet, are standard books in the departments of which they treat. In 1845 he became fellow of the College of Physicians, and in 1851 physician of the London Hospital. In the end of 1852 he sustained a fall which ruptured one of the extensor muscles of the thigh, and about six weeks afterwards, on 20th January, 1853, expired suddenly from a rupture of one of the vessels of the heart.

PEREKOP, or OR-KAPI (ancient, *Taphros*), a town, Russia, government Taurida, 85 miles N.N.W. of Simferopol, on the Isthmus of Perekop. It has irregular fortifications of wood, with a kind of castle built of stone, and contains a Greek church and a mosque. Its site is very unhealthy, and intermitting fevers are common. The chief trade is in salt, of which immense quantities are annually sent into South Russia. There are several large fairs, frequented particularly by Nogai Tartars. Pop. 4331.—The isthmus, about 20 miles long, by not more than 4 miles wide where narrowest, connects the Peninsula of the Crimea with the mainland, and separates the Sea of Azov from the Black Sea, having the Gulf of Sivach in the former sea on the east, and the Gulf of Perekop in the latter sea on the west.

PERENNIAL, in botany, is applied to those plants whose roots subsist for a number of years, whether they retain their leaves in winter or not. Those which retain their leaves are called *evergreens;* but such as cast their leaves are called *deciduous.* Perennial herbaceous plants, like trees and shrubs, produce flowers and fruit year after year, differing from annual and biennial plants, which are fruitful only once.

PERENNIBRANCHIATA, a name applied to a section of the amphibian order Urodela, to indicate those included forms in which the branchiæ or gills of early life persist throughout the entire existence of the animal, instead of disappearing when the lungs are developed, as in Caducibranchiate forms. The Perennibranchiate amphibians, breathing thus by both gills and lungs throughout life, exemplify the most typical of amphibian animals. Examples of Perennibranchiate Amphibia are seen in the Proteus (which see), Siren, Menobranchus (which see). The Axolotl (which see) appears to be generally perennibranchiate, although instances are on record in which the gills disappear, leaving the animal in the condition of a caducibranchiate form. The *Siredon lichenoides* of the United States of America exemplifies this latter peculiarity.

PERESLAV-ZALIATSKOÏ, or PERESLAVL-ZALESKI, a town in Russia, in the government of Vladimir, and 75 miles north-west of the city of that name, on the east shore of Lake Plestchieivo. Its earthen rampart has been converted into a promenade, and there is a cathedral, numerous churches, three monasteries, a nunnery; very extensive manufactures of linen, and an active trade with St. Petersburg. Pop. 7210.

PERFECTIONISTS, or BIBLE COMMUNISTS, popularly named FREE-LOVERS, an American sect founded in 1838 by John Humphrey Noyes, which is remarkable for the peculiarity of its doctrines, and the thoroughness with which they are carried out. Noyes, who was born in 1811 at Brattleborough, in Vermont, graduated at Dartmouth College, New Hamp-

shire, and was employed as a law-clerk at Putney, in Vermont, when the fierce religious revival of 1831 spread over the New England states. Noyes suddenly became grave and moody. Turning his gaze inwards he became conscious of sin and death. Feeling the world and the devil strong within him, he abandoned law in order to study theology at Andover. Here he fell into many temptations, ate and drank freely, and gave way to many other seductions of the flesh. The young divines, his fellow-students, were a bad set, who sneered at the religious world. Noyes left Andover and went to Yale College at New Haven, where he became a great seeker after truth, not as it stands between man and God only, but as it stands between man and man. Much study of Paul's epistles convinced him that the Christian faith, as it appears in the churches of Europe and America, is a huge historical mistake. The church of Paul and Peter was the true one: a community of brothers, of equals, of saints; but it passed away at an early date, our Lord having returned in the spirit, as he had promised to dwell among his people for ever. This second advent Noyes places in the year 70, since which date there has been but one true church, though many false ones bearing the Christian name. The true church consists of saintly persons, scattered here and there in all ages, confessing Christ as their Lord, professing holiness, rejecting law and usage, and submitting their passions to the divine will; the false churches are these earthly organizations built up in man's art and pride, with thrones and societies, prelates, cardinals, and popes; churches of the screw, the faggot, and the rack; having their forms and oaths, their hatreds and divisions, their celibacies, anathemas, and excommunications. Noyes took upon himself the founding of a true and visible Christian church, in which the rule of faith and that of life are equally plain. The Perfectionist has a right to do what he likes; but it is understood that, as he is guided and sustained by the Holy Spirit, he can do nothing but what is good. Some may go wrong from the fierceness of the old Adam within them, but trifling exceptions do not kill an eternal truth. He knows no law, having renounced the civil code, the statutes at large, the canons and decrees, the decalogue and the sermon on the mount, together with all his old voluntary or involuntary rules, from his temperance pledge to his marriage vows. Noyes himself determined to cast away all the safeguards invented by man, putting his faith, conduct, and salvation in the keeping of the Holy Ghost; he had been temperate, but began to indulge in ardent spirits and highly spiced meats; he had been chaste in his habits and regular in his hours of sleep, he now began to consort with courtesans, to lie in doorways, and wander about all night. Yet he says he walked through the house of sin untouched, as the Hebrew children stood unscathed in the fiery furnace. His early attempts to found a church at New Haven were discouraging. He made many converts, it is true; but each one accepting the theory of being a law unto himself, quarrels and schism inevitably resulted. At the end of four years Noyes found that though he had co-believers, he had no followers, and he returned to Putney disappointed; but resolved to make another experiment. There he founded a Bible-class, with the intention of teaching a few simple and rustic persons the way of grace; he began to see that it was quality of converts rather than quantity that was of moment to him. He now devoted himself entirely to the dozen members of his Bible-class, training them for the great experiment of the Bible family, dwelling in one house, free from the trammels, elsewhere endured, of living under law. When the training had been completed Noyes discovered that he wanted the funds to purchase a large house and a piece of ground; but fortunately one of his converts, a young lady named Harriet Hilton, furnished him with this on his offer to go through a formal marriage with her. The first family gathered into celestial order at Putney included the preacher's wife, his mother, and his sister and brother. They were joined by a few farmers, doctors, and preachers, all men of position and character, with their wives and children. They made a formal renunciation of the republican government, and declared an everlasting secession from the United States. All property was thrown into a common stock; all debts, all duties fell upon the society, which ate in one room, slept under one roof, and lived upon one common store. All prayer and religious service was stopped, Sunday was unobserved, family ties were broken up, and without separating anybody, an end was put to the selfish relations of husband and wife; a complex marriage was established, by which each man becomes the husband and brother of every woman; every woman the wife and sister of every man. To prevent the inconveniences arising from an ignorant and worldly exercise of individual liberty, a new principle had to be introduced, which they call sympathy, and which holds the same office among them as that which the rest of the world assigns to public opinion. Sympathy corrects the individual will, and reconciles liberty with light. Thus, if a young man wants anything for himself—a new hat, a holiday, a damsel's smiles—he must consult one of the elders, and see how the brotherhood feels on the subject of his wish. If their sympathy is not with him he retires from his suit. If the matter is of moment he seeks the advice of a committee of elders, who may refer it to the family in their evening sittings. The family is supposed to be always wiser than the unit. At first the saints were strict with each other; they had no means of guiding the weak or controlling the wicked save that of free and open criticism. The life was somewhat hard: three hours were spent each morning in the hall, in reading the Bible, or historical works which might enable them to understand it better, and in discussing such things as they had read and thought. The middle of the day was given to labour on the farm; evening to study, reading, music, and society. In the midst of this incessant labour quarrels again broke out. One man ate too much, another drank too much, and a third ran wild in love. This led to gossip among their neighbours, to queries about them in the public press, to attacks of rowdies and drunkards in the surrounding grog-shops, and at length into suits in the Gentile law-courts. Putney became too warm a spot for the Bible family to live in; the establishment was broken up; but about fifty of the picked and tried men, with as many women and children, held together. Clubbing their means together they in 1847 bought a piece of forest-land (about 600 acres) at Oneida Creek, a sequestered district in New York state. They built a frame-house and offices, and at once began to clear and stock the land. In the course of twenty years they made the territory one of the most productive estates in the Union. Iron manufactures, silk-spinning, and satchel-making are carried on successfully; but their wealth they chiefly owe to the inventive skill of a convert, Sewell Newhouse, an old Canadian trapper, who invented a new form of trap, the 'Oneida trap,' which has driven the article hitherto supplied by Germany from the American market. The family, at present numbering about 300, is in fact very prosperous, living together, according to report, in harmony and contentment; their neighbours have got accustomed to their ways, and the community is allowed to live in peace; even Father Noyes became popular. Frequent applications for admission to member-

ship at Oneida Creek have had to be refused, as the society is already sufficiently numerous; and two similar associations have been founded, one at Brooklyn and one at Wallingford, and both are said to be thriving. On settling at Oneida Noyes modified many of the details of his arrangements. The hard life of Putney gave way to a freer and more enjoyable one. No chiefs were chosen, as they were of opinion that the management of affairs would naturally fall into the hands of the fittest. The controlling function of criticism was made more systematic; a regard for the common good has now grown so strong from habit, that it has made persons who disavow all laws submissive to the unrecorded laws of public opinion. All are busy, and work as hard for the general interest as men do in the hope of individually enriching themselves. The men wear the dress usually worn by the country people around them; the women abjure stays and crinoline; wear a tunic falling to the knee, loose trousers of the same material, a vest buttoning high towards the throat, short hanging sleeves, and a straw hat; muslin, cotton, and a coarse silk are the usual dress stuffs; brown and blue colours are generally worn out of doors, and white for evening in the meeting-room; the hair is cut short and parted down the centre. With such simple articles a dress is made up in which, according to W. H. Dixon, a plain woman escapes notice, and a pretty girl looks winsome. The family breakfast at six in the morning, dine at twelve, and sup at six; the more advanced members abstain from animal food, drink no beer, and only use a weak home-made wine; like the most extreme American sects they never use the services of a professional doctor. The women have a good deal of influence, and appear to be contented with the working of the institution. We will conclude with a short summary of their social theory as laid down by themselves:—The communities believe, contrary to the notions of sentimentalists, that the affections can be controlled and guided, and that when this is done wisely far better results will be obtained, than if they were left without restraint and guidance. Love is not an inevitable fatality which must have its own course. The human heart is capable of loving any number of times and any number of persons at one time, and the more it loves the more it can love. The intercourse of the sexes is subject to a great number of regulations. There is first the principle of the ascending fellowship: the young of both sexes should associate in love with persons older, and, if possible, more spiritual than themselves. It is well understood by physiologists that it is undesirable for persons of similar characters and temperaments to mate together. It is not desirable for two persons to become exclusively attached to each other, to worship and idolize each other; the heart should be kept free to love all the true and worthy. Every woman is free to reject every man's attentions, the communities being pledged to protect their members from all unpleasant social approaches. It is best for men in their approaches to women to invite the intervention of a third party; by this means the matter is brought under the inspection of the community, and the women are enabled to decline proposals without embarrassment or restraint. The Perfectionists are confident that when they have worked out a few details still incomplete, their system will be complete, and that it will soon prevail over the length and breadth of America. The former failures of communism they ascribe to the previous experiments not being based upon Scriptural principles, to their being made by persons untrained for the system, and to the attempt to combine the monogamous family with the community of goods. There can be no true family without, 1st, reconciliation to God and salvation from sin, which are purely matters of faith, belief immediately washing away all impurities; 2d, recognition of the brotherhood and the equality of man and woman; and 3d, community of labour and its fruits. They claim that their system should be judged as a whole. 'Look at our happy circle; we work, rest, study, and enjoy; peace reigns in our household; our young men are healthy, and our young women are bright; we live well, and we do not multiply beyond our wishes!' For the previous account of the Perfectionists we are largely indebted to the work of Mr. Hepworth Dixon entitled New America. Some other authorities give scarcely such a rosy account of the sect.

PERFECT NUMBER, is one equal to the sum of its divisors, exclusive of itself. Thus, 6 divisible by 1, 2, and 3, which are equal to 6, is perfect. In the same manner 28 is a perfect number, and in general every number of the form $2^{n-1}(2^n-1)$ is perfect when the latter factor is a prime. Such prime factors, however, are few and not easily discovered. If n is assumed to be 5, the perfect number resulting is 496; and if it be assumed to be 31, the perfect number swells out to 230,584,300,813,952,128.

PERFORMANCE, Locomotive, a name given by engineers to a certain function of the displacement speed and horse-power of a steam-vessel. It may be shown that the horse-power required for the propulsion of a steam-ship when the water is not rough and when the speed is 'moderate' is proportional to $D^{\frac{2}{3}} v^3$, where D is the displacement of the vessel and v is its speed. Again, assuming that the efficiency of the propeller and the machinery is the same at all speeds, the indicated horse-power of the steam-engine is proportional to $D^{\frac{2}{3}} v^3$, and hence the expression

$$\frac{D\, v^3}{H.\,P.}$$

has a definite value for every steam-vessel, and in different well-shaped vessels it represents the amounts of work usefully performed by 1 lb. of fuel. This expression has been called the locomotive performance. D being in tons and v in knots per hour, the locomotive performance ranges from 200 to 260 in good vessels, and is sometimes as low as 150 in bad examples.

PERFUMERY. The business of the perfumer consists in the extraction of the odours of plants and other fragrant substances, and in combining them with inodorous materials, as grease, spirits, starch, soaps, snuffs; also in the preparation of cosmetics, dentifrices, pastes, tinctures, incense, pastils, pomades, oils, hair washes and dyes, depilatories and other toilet appendages. Perfumes of various sorts have been held in high estimation from the most ancient times. The Egyptians prepared them for various purposes; for embalming the dead, as offerings to the gods, and for domestic uses. They anointed their bodies with sweet-scented oils, which they also poured upon the heads of newly arrived guests. In the Bible frequent reference is made to the use of perfumes by the Hebrews (Exod. xxx. 23–38; Psalm xlv. 8; Prov. vii. 17; Jer. vi. 20; Mark xiv. 3; and many other places). The Phœnicians, Assyrians, and Persians are known to have made great use of them; Tyre was a famous mart where they were exported by sea, as Babylon was for the supply of the interior. The art was practised to an extraordinary extent by the Greeks and Romans. The odour of perfumes was an offering to the gods; after bathing and in their athletic exercises the Greeks applied them liberally to their persons. Their wines were perfumed by infusing in them roses, violets, and hyacinths. Pliny in his Natural History gives a full account of the great variety of perfumes used by the Romans under the emperors. The shops of the perfumers

Britain for a period of five years was 9388 oz., valued at £10,688; otto of roses, 1117 oz., value £13,561; vanilla, 3525 lbs., value £12,568. (See Piesse's Art of Perfumery, 8vo, London, 1855.)

PERGAMUS, or PERGAMUM, an ancient city of Mysia, Asia Minor, on the north bank of the Caicus, which was navigable to the sea. Behind the town, on a conical hill, rose the acropolis, which was the original nucleus of the place. It was founded by emigrants from Greece, and first rose to importance about the commencement of the third century B.C., when it became the capital of an independent state, founded by Philetærus, who had revolted against his master Lysimachus, one of the successors of Alexander the Great. A succession of monarchs reigned over the city and territory till B.C. 133, when Attalus III. bequeathed on his death-bed his kingdom to the Romans, and it subsequently became a Roman province. Under the Byzantine emperors the prosperity of the city rapidly declined. Pergamus was one of the most magnificent cities of antiquity, and was principally indebted for its architectural splendours to Eumenes II., who likewise founded the celebrated library of Pergamus, which was only inferior in extent and value to that of Alexandria. It was also famous for its manufacture of parchment, which derives its name (*Pergamena charta*) from this place. In ecclesiastical history it is memorable as one of the seven churches of Asia referred to by St. John. The modern town Bergamah occupies the site of the ancient Pergamus, and many fine remains of the latter still exist in evidence of its former grandeur.

PERGOLESI, GIOVANNI BATTISTA, a famous musical composer, was born at Jesi in 1710. In the Conservatory of the Poveri di Gesù Cristo at Naples he was initiated by Gætano Greco in the mysteries of his art. While a pupil in the Conservatory he composed his sacred drama San Guglielmo d'Aquitania, which was produced in 1731 with so much applause that several of the Italian nobility became his patrons. He about this time composed, in addition to several operas, a famous intermezzo called La Serva Padrona. In 1734 he was appointed chapelmaster of the Church of Loretto. In 1735 he was invited to Rome to compose the opera Olimpiade for the theatre Tardinone. It met with no applause, while Duni's opera of Nerone, performed at the same time, and acknowledged by Duni himself to be far inferior to it, was lauded to the skies. Bad health compelled him afterwards to take up his residence at Pozzuoli, where he composed, among others, his celebrated Stabat Mater, and died in 1736. In addition to the above works he composed a violin concerto, a number of trios for violin, violoncello, and harpsichord, and various sacred pieces which found more appreciation during his lifetime than his secular compositions.

PERI. The Peris, in Persian mythology, are the descendants of fallen spirits excluded from paradise until their penance is accomplished. They belong to the family of the genii or jin, and are constantly at war with the Devs (the evil jin). They are immortal, and spend their time in all imaginable delights. They are male and female, the latter being of surpassing beauty, and like the fairies of our popular mythology, hold frequent intercourse with mankind.

PERICARDITIS, inflammation of the membranous sac (pericardium, which see) containing the heart. In the acute stage of the disease the earliest change is redness of the pericardium from capillary injection. In some cases, particularly when death has taken place suddenly, the redness is not remarkable, probably owing to the recession of the blood from the capillaries after death. The increased vascularity is principally situated in the subjacent or connecting cellular tissue, and the redness is sometimes increased by the infiltration of minute quantities of blood into this tissue, or into the membranous sac itself, which is often thicker and more opaque than in the healthy state. The natural exhalation from the pericardium is either increased in quantity, or remarkably altered in kind, or both; the accumulated effusion which thus results constituting a principal part of the changes produced by the disease. The effused fluid usually coagulates or separates into a turbid and flocculent serum, and a concrete or fibrinous false membrane, which is organizable, and covers the free surface of the pericardium. When there is a large amount of liquid effusion which is not re-absorbed death generally takes place in the course of a few days, owing to the interference of the fluid with the action of the heart; when there is but a small quantity of liquid effusion, or when it is absorbed, the pericardium becomes more or less adherent, and life is often prolonged for many months or even years. It not unfrequently happens that after the acute symptoms have been partially subdued, and the disease has continued for some months in a chronic state—false membranes or adhesions having been formed—the inflammation either recurs, or assumes a more acute state, and gives rise to an additional deposition of coagulated fibrin (or lymph, as it is called by old authors), thereby thickening the adventitious membrane very considerably. In these cases the layers are successively redder as they are nearer the heart, and exhibit different degrees of consistence, one layer being almost fluid or purulent, while another is cellular-fibrous or semi-cartilaginous, or presents the density of tubercular induration. Changes in the substance of the heart, or in its internal surface, orifices, or valves are generally also observed in such cases, and a fatal termination is rarely long delayed.

The symptoms of pericarditis are: 1st, pain more or less acute, in the situation of the heart, extending often to the epigastrium, and to the left shoulder; and it is increased by percussion, on a full respiration, on coughing, holding the chest erect, and on lying on the left side. Frequently the pain is so slight as to be little or not at all complained of, but if pressure be applied upon the spaces between the ribs, or upwards from the epigastrium towards the pericardium, more or less internal pain will be felt; 2d, stronger and more frequent pulsations of the heart than natural; sometimes regular, sometimes irregular, tumultuous, or intermittent. The pulse commonly ranges from 120 to 150, and the respiration from thirty-five to forty-five in a minute. Watchfulness is distressing, and if the patient fall asleep he suddenly awakes in a state of agitation and alarm. The face is pale, anxious, constricted, and sunk; but is sometimes, especially as the disease advances, equally pale or equally red. The facial muscles are occasionally contracted so as to give rise to the risus sardonicus. Although strong palpitations are usually present, particularly in the early stage, they are rarely complained of. The skin is hot, and is occasionally imperspirable. An anxious respiration and a feeling of overwhelming oppression are also present, with frequent sighing, which gives momentary relief. Most of the above symptoms are aggravated by motion, or a high temperature. If the disease is not arrested in a very few days temporary or slight delirium supervenes, and, though more rarely, maniacal excitement or attacks of general convulsions. Should the malady continue longer the face becomes wan, turgid or livid, and the extremities begin to swell. For the diagnosis of pericarditis we must rely mainly on the physical signs. Early in the disease there is developed over the heart a

by which the command of the army was left to the latter and the government of the state was to be in the hands of Pericles; but this story is doubtful. On the death of Cimon he became, as it were, Prince of Athens, for although the aristocracy set up against him Thucydides, the son of Melesias, a relation of Cimon, he was too unequal to maintain the opposition. 'If I should throw him to the ground,' said he once of Pericles, 'he would say that he had never been prostrated, and would persuade the spectators to believe him.'

From this time Pericles ruled the state, and endeavoured to occupy the people with the establishment of new colonies or warlike enterprises. By his great public works he flattered the vanity of the Athenians, while he beautified the city and employed many labourers and artists. To pay the expenses of these undertakings he caused the public treasury of Greece to be transported from Delos to Athens, and justified this act by saying that the money had been raised to defend the nation from the invasion of barbarians; and as this end had been attained by the exertions of the Athenians the allies had no further right to inquire into the expenditure of the funds. His personal integrity in pecuniary matters was above suspicion. Of this we have a remarkable example. During an expedition against Eubœa the Lacedæmonians invaded Attica as the allies of the Megarians. Pericles averted an attack by bribing the tutor of the Spartan king. When he submitted his accounts for examination ten talents were charged for secret services, and the Athenians were satisfied without any further account. Pericles finally made himself master of the important island of Eubœa, B.C. 447, and soon after concluded a truce of thirty years with the Spartans. To set bounds to the popular power, which he had hitherto laboured to increase, he now procured the revival of an old law declaring no person a citizen of Athens whose father and mother were not both Athenian citizens, and caused 5000 individuals who had before been free to be sold as slaves. This act is a proof of the great influence of Pericles, and doubtless obtained the approbation of a majority of the citizens, whose importance was increased by a diminution of their numbers. Pericles took advantage of the armistice with Sparta to make war upon the Samians (B.C. 440), who opposed the pretensions of Athens. The expedition ended in the subjugation of the island and the restoration of the democratic government. The Samians soon rose and expelled the Athenian garrison, but Pericles again reduced them to subjection. On his return to Athens he delivered the celebrated funeral oration in memory of those who had perished in the expedition, which had such an effect upon his audience that the women crowded about him and wreathed his temples with flowers. Thucydides was banished in the struggles of parties, and the importance of Pericles was greatly increased till the jealousy of the Athenians awoke, when they found those hopes abortive which had been excited by the events that preceded the Peloponnesian war. Some of the friends of Pericles became the objects of public prosecutions—Anaxagoras, his venerable instructor, on a charge of irreligion; Aspasia on account of her connection with Pericles. He undertook to plead her cause himself, and was so affected that he forgot his dignity, and burst into tears. He procured her acquittal; but he withdrew Anaxagoras from the attacks of his enemies by conducting him from Attica under his own protection. The Peloponnesian war (see GREECE) has been falsely ascribed to the ambitious schemes of Pericles. It is true that he advised the Athenians not to submit to the demands of the Spartans and that he pointed out the advantages of carrying on the war; but he did so because he saw that war was inevitable, and he was convinced that as long as Athens retained the influence she then possessed Sparta would never be content. At the commencement of the war (B.C. 431) Pericles recommended to the Athenians to turn all their attention to the defence of the city and to naval armaments rather than to the protection of their territories. Accordingly, as he was made commander-in-chief, notwithstanding the murmurs of the Athenians, he allowed the superior forces of the Spartans and their allies to advance to Acharnæ, in Attica, without resistance, and at the same time sent a fleet to the shores of Peloponnesus, to Locris and Ægina, which took twofold vengeance for the ravages in Attica. After the Peloponnesians had retired he invaded the territory of Megaris, which had been the cause of the war. At the end of this campaign he delivered a eulogy over those who had fallen in their country's service.

The next year a plague broke out at Athens, which made such dreadful havoc that Pericles was obliged to summon all his fortitude to sustain his countrymen and himself. To occupy their attention he fitted out a large fleet and sailed to Epidaurus; but the mortality among his troops prevented him from effecting anything important. He returned with a small force; but the Athenians no longer put confidence in him. He was deprived of the command and obliged to pay a heavy fine, though no particular crime was charged against him. The people, however, soon recalled him to the head of the state, and gave him more power than he had before enjoyed. But amid his numerous civil cares he was afflicted by domestic calamities. His eldest son, Xanthippus, who had lived at variance with him, died of the plague. The same disease carried off his sister and many of his nearest relatives and friends, and among the rest Paralus, his only remaining son by his first marriage. To console him for this loss the Athenians repealed the law which he had himself previously introduced in regard to children whose parents were not both citizens, and thus placed his son by Aspasia among the citizens. But his strength was gone; he sunk into a lingering sickness, and died B.C. 429, in the third year of the Peloponnesian war. When he lay upon his death-bed his friends in their lamentations spoke of his great achievements, but he suddenly started up and exclaimed, 'In these things I have many equals; but this is my glory, that I have never caused an Athenian to wear mourning.'

By the death of Pericles Athens lost her most distinguished citizen. His education enlightened his mind and raised him above the prejudices of his age. His ambition was to give his country supremacy over all the states of Greece, and while he ruled it Athens maintained this rank both in an intellectual and political view. To Pericles the city was indebted for its finest ornaments—the Parthenon, the Odeon, the Propylæum, the Long Walls, numerous statues, and other works of art. The golden age of Grecian art, the age of Phidias, ceased with Pericles. He also liberally encouraged music and the drama. His name is therefore connected with the highest glory of art, science, and power in Athens; and if he is accused of having conducted the city to the edge of that precipice from which she could not escape, yet he must receive the praise of having contributed greatly to make her the intellectual queen of all the states of antiquity.

PÉRIER, CASIMIR, formerly a banker, and member of the French Chamber of Deputies, in which he was one of the most distinguished Liberal orators, was born at Grenoble in 1777, and after finishing his education at the College of the Oratory in Lyons, was drafted into the army at an early age. He served

under whose supervision the Journal appeared at irregular intervals from 1666 to 1674. In the following year its publication was resumed by the incompetent Abbé de La Roque, who was followed in 1686 by L. Cousin. In January, 1802, it was placed under the protection of the chancellor of France and a commission of learned men appointed to conduct it, among whom were the Abbé Bignon (chief editor), Fontenelle, Vertot, and others. After a more or less interrupted career its issue was stopped by the revolution about the end of 1792. In 1816 it was, however, again revived, and still continues, holding a respectable position as a scientific journal. It is now published once a month. As its contents were of a rather heavy nature, it was thought a publication of a lighter cast would find a larger public; and the second French literary periodical, the Mercure Galant, was issued in 1672 under the editorship of Donneau de Visé. Everything except politics received due notice: births, deaths, marriages; gossip from the theatres, law courts, the mansions of the great, the Academy, &c.; sermons, short tales and poems, critical disquisitions, comic essays, enigmas, all found a place. In 1717 its title was changed to the Mercure de France, and it was conducted with ability by Marmontel and others until it was abandoned in 1825. Of the other French periodicals founded last century we can mention only the Mémoirs pour servir à l'histoire des Sciences et de Beaux Arts, commonly known as the Mémoirs de Trevoux (1701–67); the Année Littéraire of Fréron (1754–91); the Magasin Encyclopédique, begun in 1795, the second series of which was called the Annales Encyclopédiques, and the third the Revue Encyclopédique; it was suspended in 1832, and a last attempt to re-establish it was made by Didot in 1846, but failed. In the present century the Revue Française, the Revue de Paris, the Revue Independante, and many more have appeared and been discontinued. But the Revue de Deux Mondes, begun in 1829, and from 1831 issued fortnightly, has been marked by an ability which has rendered it permanent, and placed it in the front rank of the critical journals of the world. In it and in several other French serials of the same character the strict review form is not preserved; tales, poems, &c., are admitted, and the names of the contributors have to be attached to their articles. Italy seems to have been the first country to have followed the lead of France in periodical publications. In 1668 the Giornale de' letterati was founded at Rome by Nazzari, and continued till 1679. Under the same title literary journals were afterwards published at Parma (1686–90) by Roberti and Bacchini; at Venice (1710–33) by the brothers Zeno; at Florence (1742); and finally at Pisa, the last having been continued, with the exception of a brief interruption, down to our own time. In the Italian Kingdom there are at present not less than sixty periodicals, many of them being literary and scientific.

With the exception of the Philosophical Transactions of the Royal Society, which first appeared in 1665, and which contained notices of books in addition to original articles, the earliest English periodical seems to have been the Weekly Memorials for the Ingenious, the first number of which is dated January, 1681–82. It lasted but a year, and some of its articles were simply translations from the Journal des Savants. It was followed by several other periodicals, which for the most part had but a brief existence, the most noteworthy being the History of the Works of the Learned (1699–1711); the Memoirs of Literature (1709; continued under different titles till 1743); the Literary Journal (Dublin, 1744–49). In the last century the nearest approach to the review in its present form was made by the Monthly Review (1749–1844), which was followed by the Critical Review (1756–1817), to which Smollett largely contributed; the British Critic (1793–1843); the Anti-Jacobin Review and Magazine (1798–1821). At length in 1802 a new era in criticism was introduced by the Edinburgh Review, supported by Jeffrey, Sydney Smith, Brougham, and others, and who were all ardent advocates of Whig principles. It soon had a formidable rival in the Quarterly Review (1809), successively edited by Gifford, Coleridge, and Lockhart, who were assisted by the contributions of Scott, Southey, Croker, Heber, &c., who wrote in the Tory interest. In 1824 the Westminster Review was started by Bentham as the organ of utilitarianism and radicalism in politics, and has numbered among its contributors Bowring, Grote, Carlyle, John Sterling, Mill, Bain, &c. In 1836 the Dublin Review was established by O'Connell and his friends as the organ of the Roman Catholic party. The Edinburgh, Quarterly, and Westminster Reviews still appear only once every three months, and recently it has been thought that there was a greatly-increased demand for critical literature to be had at shorter intervals. To meet it there was published in 1865 the Fortnightly Review, which originally appeared twice a month, but now only once; its contributors generally belong to the philosophical radical party. It was quickly followed by its rival, the Contemporary Review, to which writers of all shades of opinion contribute. The Athenæum (1828) and the Academy (1869) are weekly journals devoted to the criticism of new books, paintings and sculpture, musical and dramatic works and performances, with information on matters connected with literature, science, and art. Nature (1869) is a weekly illustrated journal devoted to the interests of the natural sciences. The Saturday Review, Spectator, and Examiner (all weekly publications) combine the character of the review with more or less of that of the newspaper. The pleasing papers of Addison and Steele in the Tatler (1709–10), Spectator (1711–12, revived 1714), and the Guardian readily found a large circle of readers who were contented with much less solid fare than was supplied by the critical journals. Johnson's Rambler (1750–51) cannot be for one moment compared to the brilliant and graceful works of the earlier essayists. The first English magazine, properly speaking, may be said to be the Gentleman's Journal, or Monthly Miscellany, commenced in 1692. It was followed in 1731 by the Gentleman's Magazine, published by Cave, and contributed to by Johnson and other eminent writers of the eighteenth century. It brought a fortune to the lucky publisher, at whose death it was continued by Henry and Nichols, the editors assuming the name of Sylvanus Urban. In addition to sketches and essays it contained for a time notices of parliamentary proceedings, obituaries, and many other items of historical interest. A magazine bearing the same title is still issued, but has lately assumed much of the same character as its contemporaries. The success of Cave's venture brought out a host of imitators. The London Magazine (1732–84); the Scots Magazine (1739–1817), the first issued in Scotland; the European Magazine (1782–1826); and the Monthly Magazine (1796–1829), conducted by Priestley, Godwin, and others, were among the chief of this class which were originated in the last century. In 1817 appeared the first number of Blackwood's Edinburgh Magazine, which soon distanced all its predecessors, and took rank as the best serial of the kind in Britain. It was conducted and contributed to by Maginn, Wilson (Christopher North), James Hogg, Lockhart, Wordsworth, Coleridge, Lamb, De Quincey, Landor,

and a host of other great literary names of a former generation; while in later times the productions of Professor Aytoun, Jerrold, Lord Lytton, George Eliot, &c., have enriched its pages. Closely approaching it in point of merit stood the New Monthly Magazine (1814), edited in turn by Campbell, Hood, Lytton, and Ainsworth; Fraser's Magazine (1830–82), among whose writers were Maginn, Carlyle, Allan Cunningham, Galt, Hogg, Mahoney, Southey, Warren, Procter, Thackeray, Froude, &c.; and the Dublin University Magazine (1832). A new era in this kind of literature was inaugurated by the shilling monthlies, the first being Macmillan's Magazine (1859); Cornhill Magazine (1859), edited until his death by Thackeray; Temple Bar (1860); closely followed by St. James' Magazine, St. Paul's, Tinsley's, Belgravia, London Society, &c. Another step in the direction of cheapness was shortly afterwards made, the Argosy, Good Words, the Sunday Magazine, &c., followed at a long interval by Longman's Magazine, the Cornhill Magazine (reduced in price), the English Illustrated Magazine, and others being published at sixpence. Weekly periodicals to suit the tastes of all classes, at prices from a penny to threepence, have come into fashion since 1832, when the initiative was taken by the Penny Magazine, which soon found a rival in Chambers' Journal. Among the best of these serials we may mention Household Words (1850), continued under the title of All the Year Round, and for many years edited by Dickens; Leisure Hour (1861, now a monthly); Sunday at Home; &c. The weekly issues of such periodicals may be generally had bound up in monthly parts. At the close of the year 1883 there were published in Great Britain and Ireland 1260 periodicals (including quarterly reviews), 332 of which were entirely devoted to religious matters; many are also issued in the interests of special sciences, arts, professions, trades, &c.

The earliest of the German publications in this department of literature was merely a translated edition of the Journal des Savants; but in 1682 appeared an original work, the Acta Eruditorum. It was wholly written in Latin, was strictly Lutheran, but was governed by no systematic code of criticism or philosophy; and in spite of its profound learning, and the contributions of such men as Leibnitz, Seckendorf, and Cellarius, its career was closed in 1776. The first literary serials in the German language were written in the form of dialogues; they were the Monatsgespräche (1688–89) of Thomasius, and the Monatliche Unterredungen (1689–98) of Tenzel. The first really successful undertaking of the kind was the Deutsche Acta Eruditorum, an imitation of the Latin periodical. Under the title of Gelehrte Zeitung almost every large town had at some period of the eighteenth century its literary journal, such, for instance, as that published at Frankfort (1736–86), Halle (1766–92), Gotha (1774–1804), and others. But of more importance than all these was the Göttinger gelehrte Anzeigen, begun in 1739 as the Zeitungen von gelehrten Sachen, among whose editors have been Haller, Heyne, and Eichhorn, and which is still published. In 1766 Nicolai founded the Allgemeine Deutsche Bibliothek, which lived over forty years; the more valuable Briefe, die neueste Literatur betreffend, supported by Lessing, Mendelssohn, and others, had an existence of only six years (1759–65). Among the other notable periodicals established in the last century and in the beginning of the present, we may mention the Allgemeine Literatur-Zeitung (1785–1848); the Jenaische Allgemeine Literatur-Zeitung (1804–48), to which the great literary circle of Weimar, of which Goethe was the centre, contributed. For a list of the more important German periodicals of our own age see GERMANY.

The date of the first American literary periodical is 1741. In that year Franklin issued at Philadelphia the General Magazine and Historical Chronicle, on the plan of the Gentleman's Magazine, but it had only a six months' existence. It would be impossible to give a list of the host of its successors; a large majority never obtained anything like success or permanence. They were for the most part issued from the presses of Boston, New York, and Philadelphia, which still produce the greater proportion of the present periodical literature of America. The most noted Transatlantic reviews and magazines of our times are the North American Review (1815); the New Englander—both published quarterly; Silliman and Dana's Journal of Science and Arts—alternate months; Harper's New Monthly Magazine, the Atlantic Monthly, Lippincott's Magazine, the Overland Monthly, Scribner's Monthly, now the Century Magazine, &c., published once a month.

PERIOSTEUM, the fibrous membrane investing the bones, and which serves as a medium for the transmission of the nutritive blood-vessels of the bone. The membrane which lines the *interior* of the cavity of long bones is termed the *medullary periosteum*, or *internal periosteal membrane*. The periosteum firmly adheres to the surface of bones, save at their gristly or cartilaginous extremities, and it becomes continuous with the tendons or ligaments inserted into bones. The periosteum consists of two layers, which are firmly united. The inner layer is of elastic nature, and appears to consist of layers of fibres. The outer layer is composed of connective tissue and a slight development of fat cells. The periosteum of newly-formed bones is much thicker than that investing the fully-developed structures. In young bones the periosteum is loosely attached to the shaft, and between the growing bone and the periosteum a layer of soft *blastema* or formative matter is interposed, this layer contributing to the formation of new bone on the outer surface of the structure. As the bone advances in development, and in adult life, the periosteum grows much thinner, and it becomes in time more or less firmly adherent to the bone. When the periosteum, through disease or injury, becomes affected the blood-supply and nutrition of the bone suffer, and in consequence the bone-tissue dies or becomes *necrosed*, and is exfoliated or thrown off in the form of a *sequestrum*. The *alveoli* or sockets of the teeth are lined by periosteum, and this membrane is reflected on to the tooth, and invests it as far as the neck. The periosteum at the neck of the tooth merges with the fibrous structures of the gums. When a bone is fractured the periosteum plays an important part in the repair of the injury, new osseous material being deposited by the membrane. Experiments have been made to show that if the shaft of a bone be completely removed, leaving the periosteum uninjured, this membrane will fully and entirely replace the bone by the formation of new bone-tissue.

PERIPATETIC PHILOSOPHY. The philosophy of Aristotle received this name from the shady avenues (Greek, *peripatoi*) in which he was accustomed to walk up and down with his more intimate disciples, while he expounded to them the abstruser doctrines of his philosophy. We can give but a brief sketch of the system of this powerful mind. The investigations of Aristotle extended to all branches of knowledge. Yet his numerous treatises cannot be said to make up a single system, all the parts of which are inter-dependent. All regions of nature and speculation were explored by him, but each was explored separately. Hence we do not find him dividing the whole sphere of human knowledge into co-ordinate and subordinate parts, and taking up

each of these in regular sequence; and when he does mention the divisions of science, the divisions he makes at different places are not consistent with one another. When, however, he speaks with most precision, the division he adopts is a threefold one: philosophy, that is, scientific knowledge in general, he regards as made up of theoretical, practical, and poetical philosophy, by the last of which he meant that which treats of the principles both of the useful and of the fine arts. This division is the most convenient to follow in a sketch of the peripatetic doctrines.

Theoretical philosophy was divided by Aristotle into mathematics, physics, and what he called first philosophy (*prōtē philosophia*), and was afterwards called metaphysics. This division does not include (at least expressly) the science of logic, that science which is so peculiarly Aristotelian that it is instanced by Kant as having been begun and completed by Aristotle himself. The reason of this omission is that he did not make any distinct separation between logic and metaphysics. The philosophy of Aristotle starts from his criticism of the Platonic doctrine of ideas, and cannot be properly understood by any one unacquainted with Plato's system, and indeed with the whole course of Greek philosophy. The solutions given by Aristotle of the highest problems that then engaged the human mind cannot be fully comprehended unless we see the mode in which these problems came to be proposed in the form in which they were grappled with by that philosopher. The Eleatics had asserted the unity, and hence the unchanging permanence of all real existence. But this implied the denial of real existence to the world of sense, which is indisputably manifold and changing; but this denial they were unable to maintain, and as they could not reconcile with their fundamental tenet the fact of the existence of the world of sense (at least in thought, which is itself sufficient to constitute a real manifold existence) their system was seen to be untenable. Seeing this, Heraclitus opposed to the principle of the Eleatics the doctrine of constant change, as the true account of the universe. According to him there is nothing really permanent but change; all else, all real existences are in a constant state of flux. These were the two leading views that characterized Greek philosophy down to the time of Socrates and Plato, and it was these two views that Plato attempted to harmonize in his doctrine of ideas. Socrates in his teaching had laid great stress on the formation of notions, as the means of arriving at true scientific knowledge in the shape of general truths. Plato pointed out that the fact of there being such general truths, permanently and unalterably valid, overthrew the Heraclitan doctrine, that there is nothing really permanent in nature. It is true that individual existences are constantly changing, constantly perishing; but this, according to Plato, does not destroy the reality of permanent beings, else how could we make propositions which are permanently true of the classes or genera to which the individuals belong? This observation not only shows the falsity of the Heraclitan doctrine that there is no permanence, but also leads us to see where it is that permanence is to be found; not in the world of sense, but in the ideas of which general truths are composed. Since there is such a thing as true scientific knowledge, the ideas of which our knowledge is made up must have a real objective existence; otherwise it would not be true, for truth consists in the correspondence of belief with actual fact. The ideas then have a real, permanent, unchanging existence, and are in fact the only real existences. Although they can only manifest themselves in the individuals of the world of sense, yet they are what gives to these individuals all the reality that they possess.

Such was Plato's mode of harmonizing the conflicting doctrines of Heraclitus and the Eleatics. He admitted the force of the objections made to both doctrines taken independently: to the Eleatic, that there is no variety and change; and to the Heraclitan, that there is no permanence; but he held that in the variety and change of the sensible world, which he admitted as a fact, all that is real is the permanent, the idea. To this doctrine Aristotle objects that the ideas of Plato are nothing else than the things of sense immortalized and eternalized. Plato has not shown the connection between his ideas and the things of sense, nor has he explained the changes which take place in the things of sense, which he yet admits to be actual; for although he says that the ideas are not only self-existent realities, but also the cause of the changes in the world of sense, this cannot be, for the ideas are given as fixed and immutable, and accordingly have no principle of movement in them. Aristotle then proceeds to give his own account of the ideas and of the mode in which changes originate, and in doing so is led to the fundamental antithesis of his philosophy, that between matter and form (*hylē* and *eidos*). The notion or idea of a thing is not, he says, a separate existence numerically different from the thing itself, but is related to the thing only as form to matter. Every sensible thing is a compound (*synolon*) of matter and form, the matter being the substance of which the thing consists, while the form is that which makes it a particular thing (a stone, for example, and not a tree), and therefore the same as its notion or idea. The form is the true nature of a thing (so far he agrees with Plato); but substance (*ousia*) in the principal and proper sense of the word belongs only to the individual and concrete, that is, to the *synolon*. The opposition between matter and form is the leading conception of Aristotle's whole metaphysical system. When, indeed, he gives a more detailed analysis of the constitution of anything, he speaks of four principles or causes; the material, the formal, the efficient, and the final. Thus, in a boat, the wood of which it is made is the material cause, the form of the boat (in the Aristotelian sense of the word form) is its formal cause, the builder is the efficient cause, and the boat itself in its completeness and fitness for sailing is the final cause. But to Aristotle the last three are really one. According to his view the formal or the final cause (which are obviously identical), when fully apprehended, includes the efficient cause. To him the idea of the form of a thing, that is, the complete realization of that thing in the matter of which it is composed, implies the idea of the means which mould the matter in the proper way. To us a proposition expressing this view gives no information whatever. It is no more than saying that a thing is the cause of itself. But it was different with Aristotle. The view was suggested to him by the phenomena of vegetable, animal, and social life, rather than by those of mechanical construction. It was the best way he had of expressing such facts as that a plant or animal always reproduces its own kind, or that aggregates of individuals inevitably form themselves into a state. We are accustomed to look to secondary causes as containing the true explanation of things, as the only things that really give us information regarding the origin of objects of nature or art; but Aristotle on being asked why the oak always reproduces the oak, and no other tree, would have replied, overlooking secondary causes, that it was because it belonged to the form of the oak enfolded in the acorn to realize itself in an oak, and nothing else. The oak is thus the cause of itself. We have a relic of this mode of thought in

the use of reflexive verbs instead of passives, which is common in some languages, and which may be illustrated in our own. We may say, for example, that a system of credit necessarily develops itself among a people extensively engaged in commerce. We use such an expression, but we all understand by it that there are causes in human nature which, in such circumstances, inevitably bring about a system of credit. To Aristotle the statement would have been a sufficient explanation as it stands. The system is the outcome of its form or idea. The achievement of philosophy subsequent to Aristotle was to break up the meaning in a thought really complex, though apparently simple, and is an illustration of the function of metaphysics in all cases; but the fact that this can be done, and that it is indeed the only way by which we can arrive at an intelligible and consistent view of our experience, makes us none the less indebted to those who furnish us with the complex thoughts in which simpler truths are wrapped up.

Aristotle, then, reduces everything to matter and form, and having explained the relation between the two he next deals with the difficulty of origination, change, that which Plato had left unsolved with his fixed ideas. In doing so Aristotle comes to a new antithesis, or rather a new way of stating the same antithesis. His view, he says, removes the difficulty as to origination altogether. It is quite true that nothing can originate from what is, nor from what is not; but origination is not creation, it is merely matter acquiring form, it is merely a transition from potential to actual existence. Everything that actually exists, as an *ousia* or *synolon*, previously existed potentially in the matter of which it is composed. Matter is thus related to form as potentiality to actuality (*dynamis* to *energeia* or *entelechcia*). This relation is not, however, a fixed one. A thing may be matter in one relation and form in another. The matter from which one *synolon* proceeds may be itself a *synolon*. Thus, wood is the matter of a boat, but it is itself a *synolon*, and is form with relation to a growing tree. It is only when we descend to the simplest *synolon* that we can say that the matter of which it is composed is nothing but matter, and is not form in any relation whatever. This first matter (*prōtē hylē*), although a mere abstraction, with no existence in the world of sense, is not, as Plato attempted to maintain in spite of his recognition of the manifold and changing, absolutely non-existent. It exists in relation to form as a privation (*sterēsis*), inasmuch as it deprives of actual existence all the things which it potentially contains. As there is, on the one hand, this formless matter, which is mere potentiality without actuality, so, on the other hand, there is a pure form (*prōton eidos*), which is pure actuality without potentiality. This pure form is the eternal Being, who is variously styled by Aristotle the first mover (*prōton kinoun*), since actuality, the formal cause, is, as we have seen, the necessary presupposition of all movement from the potential to the actual, the absolute notion, and the absolute end. The whole of nature forms a scale rising from the lower to the higher of these extremes, from pure matter to pure form, and the whole movement of nature is an endeavour (incapable of realization) of all matter to become pure form. Motion is the transition from the potential to the actual. Space is the possibility of motion. Time is the measure of motion.

Such was Aristotle's metaphysical theory of the universe. According to his physical conception the universe is a vast sphere in constant motion, and in the centre of which is our earth. The boundary of this sphere is the sky or heaven, which is nearest the first-mover, and partakes of the most perfect motion, that of the periphery. Within this outer sphere, between it and our earth, are the spheres of the fixed stars and of the planets, including the sun and moon. The lowest rank is occupied by the earth, which merely receives motion, and does not impart it to anything else, while the three other spheres both receive and impart it. There are five elements, ether, fire, air, earth, and water; the first of which fills the celestial spaces, while the other four are terrestrial. On this earth, as in all nature, there is a regular scale of beings; the lowest of which are the inanimate beings; next above which are vegetables, to which nutrition belongs; then the lower animals, which have only nutrition and sensation; then the higher animals, which have nutrition, sensation, and locomotion; and finally there is man, who adds to all these reason (*nous*). The soul (*psychē*), which is merely the animating principle of the body, and stands to the body in the relation of form to matter, cannot be thought as separated from the body; but the reason is something higher than that, and as a pure intellectual principle exists apart from the body, and does not share in its mortality. It is what is divine in man, and bears the same relation to the soul as God to nature.

Practical philosophy is divided by Aristotle into ethics, economics, and politics. In his Nicomachean ethics he expounds his ethical system, and in his politics he makes a detailed examination of political systems. We have no treatise of his on the subject of economics. His moral system treats of two ideas, happiness and virtue. All action, he says, has some end in view, and the highest end, that which is not again a means, all are agreed in calling happiness. But the only account of happiness which can be given is that it depends upon the peculiar nature of man, and is the accompaniment of that course of action which exalts that nature into the most perfect actuality; and as the nature peculiar to man is his reason, that course of action must be rational or virtuous action. He does not, however, maintain that happiness is wholly independent of accidental circumstances of fortune. He allows to these their weight, but gives chief prominence to virtuous activity as the condition of happiness. Virtue (in the agent) is defined by Aristotle as a direction of the will confirmed by habit (*hexis proairetikē*) towards the mean fixed for us by reason, or that which the man of understanding (*ho phronimos*) would determine. All action, he explains, may err either by excess or by defect. Right action is accordingly that which avoids both these extremes, and every (objective) virtue lies between two vices. Thus, courage is the mean between fearing and rash daring, liberality between niggardliness and profuseness. But the virtues belonging to different stations and relations are different. That of a freeman is not the same as that of a slave; that of a man is not the same as that of a woman; that of a father as that of a child; and so on. Hence the necessity of the phrase in the definition of virtue, requiring the mean to be that fixed 'for us,' that is, for each individual. How we are in each case to determine the proper mean Aristotle does not say, further than that it must be fixed by reason, or the judgment of the man of understanding. This analysis of the virtues, however, only applies to the ethical virtues. Aristotle mentions another class of virtues, the dianoetical, or virtues of the reason (*nous*), the highest of which is philosophic contemplation (*theōria*).

For the attainment of the practical ends of life it is necessary for man to live in society and form a state, the object of which is the protection of the individual members, and the affording of opportunities for the assistance of others and the practice of virtue, and ought also to be the development of virtuous habits in

all its members. Which form of government is best adapted to fulfil these ends Aristotle does not say. The best form of government is determined by the particular circumstances of the society for which it is intended. The government may be in the hands of a single individual, in the hands of few, or in the hands of many, and in all these cases it may be both good and bad. The good forms of government are monarchy, aristocracy, and timocracy (a republic in which the state offices and honours are distributed according to a rating of property); and the bad forms are tyranny, oligarchy, and democracy.

The poetic philosophy of Aristotle has been worked out only in the case of poetry in the narrower sense of the term, which forms but a small part of all that belongs to this branch of inquiry, which includes, as already stated, the useful as well as the fine or imitative arts. The aim of the latter, according to Aristotle, is threefold: first, they are a means of recreation and refined enjoyment; secondly, they emancipate the soul from the mastery of the feelings by a temporary and beneficial excitation of them; and thirdly, they promote moral culture.

The school of Aristotle (the Peripatetic school) continued at Athens uninterruptedly till the time of Augustus. Among those who proceeded from it during the first two or three centuries after his death are Theophrastus, author of several works on natural history: Eudemus, the author or editor of the Eudemian Ethics, which are probably a recension of Aristotle's lectures; Critolaus, Diodorus, and Cratippus. These for the most part abandoned the metaphysical side of Aristotle's teaching, and developed chiefly his ethical doctrines, or devoted themselves to the study of natural history. Strato of Lampsacus earned the title of the Physicist by rejecting the principle of *nous* or reason in Aristotle's system, and upholding nature as the source of all existence, even of thought. Later Peripatetics returned again to the metaphysical speculations of their master, and many of them distinguished themselves as commentators on his works. Of these may be mentioned Andronicus of Rhodes (flourished 58 B.C.), the arranger of the works of Aristotle; Nicolaus Damascenus (flourished in the beginning of the Christian era); Aspasius (flourished 80 A.D.); Alexander of Aphrodisias (flourished 200 A.D.), the most celebrated of all; Porphyrius, the Neoplatonist, in the third century; Themistius, in the fourth; and Philoponus and Simplicius, in the sixth; as well as Boëthius, who in the same century translated the works of Aristotle into Latin. No one of the philosophical schools of antiquity maintained its influence so long as the Peripatetic. The philosophy of the Arabians was almost exclusively Aristotelianism, and there were no more ardent admirers of Aristotle than Avicenna, or Ibn-Sina (eleventh century), and Averroes (twelfth century), the two most distinguished of his Arabian commentators, the latter also his translator, and called by the Arabians, on account of his services as expounder of Aristotle, The Interpreter. Even down to modern times its principles served as the rule in philosophical inquiries, and some countries still honour Aristotle as an infallible master of wisdom. The Arabians did not first make him known to the philosophers of modern Europe, but they extended his authority We find him in the Christian Church as early as the time of the Arian controversy; and while the influence of Plato was diminished by the heresies of Platonizing teachers, that of Aristotle, who was known, however, only through the translation of Boëthius, was continually increasing. (See SCHOLASTICS.) When the works of Aristotle again began to be read in the original language a Peripatetic sect, differing from the Scholastic, arose in the fifteenth and sixteenth centuries, which was divided into the Alexandrians and Averroists (so called from the two most celebrated commentators on Aristotle). To the former belonged the famous Pomponatius and others, and to the latter Alex. Achillinus, Zimara, and Cæsalpinus.

PERIPNEUMONIA. See PNEUMONIA.

PERISSODACTYLA (Greek, *perissos*, uneven; *daktulos*, finger), one of the two great divisions of the order of Ungulata or Hoofed Quadrupeds, the animals included in which are distinguished by the fact that the toes, numbering one or three, are odd or uneven in number. This term is opposed to the Artiodactyla or 'Even-toed' Ungulata. The femur or thigh-bone in Perissodactyla possesses a third trochanter. The hind-feet are odd-toed in them all, and the fore-feet in all save the Tapirs, in which four unsymmetrical toes exist on the front-limbs. The dorso-lumbar vertebræ never number less than twenty-two. The horns, when developed, are always median or unpaired, and are never supported on bony 'horn-cores.' The stomach is simple in structure, and a large cæcum is developed. The families Rhinocerida (Rhinoceros), Tapiridæ (Tapirs), and Solidungula (Horses) represent the living members of this group, which also includes the extinct Palæotheridæ. See UNGULATA and PALÆOTHERIUM.

PERISTALTIC (or VERMICULAR) MOTION, the name given to the movements observed in the stomach and intestines, which proceed with a wave-like or spiral motion, the object of which is to gradually propel forwards the contents of these viscera. The contractions are produced by the muscular walls or layers of the stomach and intestines (for a description of which see the articles INTESTINE and STOMACH). The movements may be studied in the intestine with the greatest facility. Successive portions of the intestine contract and dilate alternately, this order of motion producing wave-like movements, extending along the axis of the tube. The *longitudinal* muscular fibres, or those disposed in the long axis of the bowel, first contract, their action drawing the portion of intestine backwards over the contained substance. The circular fibres then contract from above downwards, and thus propel the contents of the bowel from one portion or segment onwards to the next portion, where a similar series of actions will take place in succession. The peristaltic movements occasionally take place in an opposite direction, and force the contents of the intestine backwards instead of forwards. But this latter phase occurs only in a limited extent. The muscles of the large intestine are proportionally stronger as required for the propulsion along the tube of the fæcal matters, or those intended for expulsion from the body. The *rectum* or terminal portion of the intestine possesses the strongest fibres of all, the *sphincter muscles* of the anus being formed by the modification of the circular fibres of that portion of the bowel. The intestinal movements, under certain conditions, may be perceptible to the individual in which they occur, but under ordinary circumstances the contents of the bowel are propelled without any perceptible sensation.

The food, on entering the *stomach*, is propelled by vermicular movements of its muscular layers from the *cardiac* towards the *pyloric* or intestinal extremity; the contents of the stomach are thus gradually approximated towards the bowel. The movements in the stomach increase in force and rapidity as the process of digestion in that organ proceeds. These movements not only propel the food as thus described, but also tend to cause a thorough circulation of the contents of the stomach through that organ, so as to thoroughly incorporate the food with the gastric juice. Occasionally the stomach may, by the action of its

circular muscular fibres, appear strongly contracted in its middle portion, thus producing what is known as *hour-glass* contraction of the organ.

PERISTYLE, a name given in architecture to a range of columns surrounding anything, as the cells of a temple, or any place, as a court or cloister. It is frequently but incorrectly limited in signification to a range of columns round the interior of a place.

PERITONEUM, the serous membrane lining the abdominal cavity. Like all other serous membranes (see MEMBRANE), the peritoneum presents the structure of a closed sac; one layer (*parietal*) lining the abdominal walls, the other or *visceral* layer being reflected over the organs of the abdomen. A cavity—the *peritoneal cavity*—is thus inclosed between the two layers of the membrane, and this contains in health a quantity of serous fluid just sufficient to moisten its surfaces. In the female the peritoneum, strictly and anatomically speaking is not a thoroughly closed sac; since it is placed in communication with the interior of the *uterus* or womb through the *oviducts* or *Fallopian tubes*, which extend from the uterus on each side, and have their free ends next the cavity of the peritoneum. In the male no such communication exists. The inner surface of the peritoneum is smooth and glistening, and is invested by a layer of *squamous epithelial cells*. The membrane is disposed around the abdominal viscera so as to enfold them, and thus to place most of them *outside* its surfaces. In the case of the pancreas, kidneys, and supra-renal capsules, these organs lie quite behind the peritoneum. The liver, stomach, jejunum, ileum, and certain portions of the large intestine, are, on the contrary, completely surrounded by it. The lower portion of the duodenum, of the cæcum, and the ascending and descending colon, are covered in part only by this membrane. In cases where the contained viscera require a certain range of motion, as, for example, the large intestine, the peritoneum is thrown into *rugæ* or folds, so as to admit of limited movements on the part of the organs. The peritoneum in its circular disposition may be described by starting from the diaphragm or midriff, from which muscle two layers pass to form the *lateral ligaments of the liver*. (See LIVER.) These layers inclose that organ by their division, and again meet or unite on its under surface, to be continued to the lesser curvature of the stomach, where they form the *gastro-hepatic omentum*. (See OMENTUM.) The two layers again separate, unite at the greater curvature, and are then continued downwards to form the large fold over the small intestines, known as the *great omentum*. Passing upwards from this point, the peritoneal layers inclose the colon; and behind the colon they are attached to the spine, thus forming the *transverse meso-colon*. From this latter point one layer passes upwards in front of the pancreas or sweet-bread, and arrives at the diaphragm, thus bringing the membrane to the point at which our examination commenced. The other layer passes downwards from the transverse meso-colon and overlies the small intestine, whence it is reflected backwards to the spine, and thus forms the *mesentery* or great supporting band of the intestines. Passing downwards from its mesenteric attachments, it dips into the pelvis, and covers the upper two-thirds of the *rectum* or terminal portion of the bowel. From the rectal surface it passes forwards to the posterior surface of the contiguous *bladder*, and thus forms between the rectum and bladder a pouch-like fold, known as the *recto-vesical* pouch. Thence it passes forwards to the front wall of the abdomen, along which it is continued upwards to the diaphragm, there to meet its companion layer, and to complete the circle. In the female the peritoneum passes from the rectum on to the hinder wall of the vagina, and thus forms the *recto-vaginal* pouch; and from this point it is reflected over the entire back and over about half of the front surface of the uterus. From the uterus it passes in turn to the hinder wall of the bladder; and from this latter point its disposition in the female corresponds with that of the male. Anatomists also speak of the *greater and lesser cavities of the peritoneum;* the lesser cavity being placed behind the stomach, and the descending layers which form the great omentum. This lesser cavity is bounded by the liver above. The *foramen of Winslow* —which aperture lies behind the right edge of the lesser omentum, and in front of the *vena cava inferior* —connects the lesser cavity with the greater.

The peritoneum is subject to inflammatory action, constituting the affection known as *peritonitis*, which in its acute form frequently proves a fatal malady. Surgeons were formerly much deterred from operating upon the peritoneum from a fear of setting up inflammation; but recent researches have shown that this membrane is by no means so liable to take on this action after operations as was supposed; and accordingly—as in the operation of *ovariotomy*, or the removal of diseased ovaries—surgeons now handle and operate upon this membrane and its surroundings with greater freedom than a few years ago would have been considered rational or possible.

PERITONITIS, inflammation of the peritoneum or serous membrane which envelops the abdominal viscera. It is either acute or chronic, and the chronic form either simple or tubercular. The internal marks of peritonitis in a person who has died of it are an effusion of sero-purulent liquid in the abdominal cavity; the peritoneum injected, red, and dry or sticky to the touch; the intestinal convolutions adhering to one another or to the walls of the abdomen. The first symptom of acute peritonitis is sometimes a violent shivering, but more usually it is a feeling of acute shooting pain localized in some part of the abdomen. This is followed by hiccuping, inclination to vomit, and finally vomiting, all of which commotions cause extreme suffering to the patient. The pulse is strong and quick, the breathing short, the abdomen swollen and tense. The duration of this form of the disease is not more than one or two weeks; in very acute cases all the stages are passed through in a few hours. The disease is a very rare one, but more common among women than among men. It is sometimes a grave complication of puerperal fever. It usually results from some injury done to the abdominal viscera, either by a perforation or by some obstruction or irritation due to the presence of some morbid product. It is in the first case that the disease is most violent, and when the perforation is large there is no hope of any but a fatal result. When the perforation is small, and the effusion of liquid consequently not very great, there is a possibility of the lips of the opening adhering together or to the surrounding parts, and thus closing the opening before the disease has developed to such a height as to remove all chance of a cure. The treatment in this case is to give large doses of opium, so as to insure perfect rest to the bowels, and thus facilitate the necessary adhesion. When peritonitis is caused by some obstruction or local irritation its course is less rapid. The inflammation is at first confined to the part where the obstruction exists, but gradually extends to other parts, and if the obstruction is not removed in a short space of time gangrene ensues, and death is inevitable. Whatever be the occasion of an attack of acute peritonitis it is always a formidable disease, demanding prompt attention. Bleeding, application of leeches in considerable numbers (50 to 100), and of emollient poul-

tices and fomentations to the abdomen when the patient is able to bear their weight, bathing in tepid water, and when the most dangerous symptoms manifest themselves internal doses of mercury and external applications of mercurial unguents, are the means of cure resorted to.

Chronic peritonitis in eleven cases out of twelve occurs in the so-called tubercular form, in which numerous small granules resembling tubercles, and considered by some authorities to be tubercles, are found underneath the peritoneal tunic of the intestines. When simple chronic peritonitis does happen it is usually in consequence of a previous acute attack imperfectly cured. The other form of the disease is almost confined to persons of a scrofulous habit of body. Chronic peritonitis is often due to some cancerous tumour in the intestines, or to real tubercles different from the granules which are so often produced by the disease. The anatomical characteristics of the disease are adherence of the intestines to one another in masses or to the walls of the abdomen, and the formation of false membranes. Its symptoms are a dull pain increasing under pressure, and subject to temporary exacerbations, especially during digestion; sometimes constipation and sometimes diarrhœa; vomitings of greenish matters; a constantly increasing emaciation, accompanied by dryness of the skin, which takes on an earthy colour. The course of the disease is extremely slow. It long remains apparently stationary, but a period arrives when the diarrhœa becomes constant, the lower members become suffused with liquid, and the patient sinks to the last degree of weakness, and finally succumbs. Little can be done in cases of chronic peritonitis beyond using means to relieve the pain and maintain the strength of the sufferer, and possibly to delay the fatal result which is almost inevitable.

PERIWINKLE (*Vinca*), a genus of plants of the natural order Apocynaceæ or Dog-bane family. They are herbaceous or suffruticose plants, with leaves furnished with glands at the base. The flowers are axillary and solitary, or in pairs; the corolla is tubular, with a slight swelling in the shank, and divided in the upper part into five divisions; the fruit consists of two follicles containing numerous seeds of a somewhat dark colour. They are found in Europe, India, and Madagascar. The Lesser Periwinkle (*Vinca minor*) does not exceed 16 inches in height. It is a vivacious plant, with creeping roots and slender stalks. Its leaves are opposite, elliptical, leathery, and shining. The flowers are of a fine blue colour, with smooth lanceolate segments. This plant blossoms in early spring, and is pretty common in woods, hedges, and thickets in many parts of Europe and in the south of England. It is sometimes cultivated in gardens, where it may be made to yield purple and variegated flowers, both single and double. Among the ancients it was the symbol of virginity. The Greater Periwinkle (*Vinca major*) has larger flowers than the preceding (sometimes 2 inches in length). The calyx has linear lobes with a hairy fringe. It grows almost in the same districts as the Lesser Periwinkle. The *Vinca rosea* is a native of Madagascar, and is distinguished by its rose-coloured flowers, woody stem, leaves covered with soft hairs and terminating in a sharp stiff point. The corolla has a ring of scales round the throat. Many varieties of this species are cultivated. The members of the periwinkle genus have astringent and acrid properties.

PERIWINKLE (*Littorina*), a genus of very common molluscs on the British coasts, belonging to the order Prosobranchiata and family Littorinidæ or Shore Molluscs, so called because they mostly frequent the coasts and feed upon sea-weeds. The shell is spiral, has few whorls, and is without a nacreous lining, a characteristic which distinguishes it from certain shells that otherwise resemble it; the aperture is rounded and entire or unnotched (holostomatous). The foot is of moderate size, has a longitudinal groove along the sole, so that each side in walking advances in turn; the eyes are set at the outer bases of the tentacles; the tongue or 'odontophore' is furnished with a formidable array of teeth, so as to enable the animal to rasp down with facility the vegetable matter on which it feeds. The Common Periwinkle (*L. littorea*) is so common as to need no description. It occupies the zone between high and low water marks, and is gathered and eaten in immense quantities. It is called the *wilk* in Scotland, in some parts simply the *buckie*, but is quite different from the Mollusc called *whelk* (*Buccinum*) in England. Another species, the *L. rudis*, is also common on British coasts, but is seldom eaten, the shells with which the young are provided before coming into the world making it feel gritty to the teeth.

PERJURY, by the common law of England, is a crime committed by one who, being lawfully required to depose the truth in any judicial proceeding, wilfully swears falsely in a point material to the question in dispute. A person is not guilty of perjury who swears what he really thinks, remembers, or believes, but he may be indicted for perjury for swearing that he *believed* a fact to be true which he knew to be false. The common law takes no notice of any false swearing but such as is committed in some court of justice having power to administer the oath, or before some officer or magistrate invested with similar authority in some proceeding relative to a civil suit or criminal prosecution. By numerous statutes in England the penalties of perjury have been extended to false oaths by electors, bankrupts, insolvent debtors, &c. By the English law the evidence of one witness alone is not sufficient to convict on an indictment for perjury; in such case there would be only one oath against another; but it is sufficient if corroborated by other independent evidence. Subornation of perjury is the offence of procuring a man to commit perjury. By the law of Moses (Deuteronomy xix. 19), if a man testify falsely against his brother, it shall be done unto him as he had thought to do against his brother. And this is the principle adopted in the laws of many of the states of modern Europe. By the law of the Twelve Tables 'perjurii pœna divina, exitium; humana, dedecus.' Gellius, xx. 1, mentions that some persons who had perjured themselves by giving false testimony were thrown from the Tarpeian Rock. The civil law punished perjury committed in swearing by the name of God, in civil cases, by infamy (Digest, lib. ii. tit. 4; Code, lib. xii. tit. 1); but the punishment of perjury committed in swearing by the safety of the emperor was death (Code, iv. 1, 2); by the genius of the prince, beating and scourging (Dig. lib. xii. tit. 2, 13. The punishment of perjury and subornation of perjury, by the common law in England, was anciently death, afterwards banishment or cutting out the tongue, then forfeiture of goods. At present the punishment at common law is by fine and imprisonment, but there are several statutes which empower the court which tries a case of perjury to inflict other punishments, either in addition to or in lieu of those that may be inflicted by common law. The principal of these are, 2 Geo. ii. cap. xxv., made perpetual by 9 Geo. ii. cap. xviii., which enables the court to send an offender for perjury to hard labour for seven years, or to penal servitude for not more than seven or less than five years; and 3 Geo. iv. cap. cxiv., by which the offender may be sentenced to imprisonment with hard labour for any term for which he may be lawfully imprisoned.

These acts do not extend to Scotland, where the punishment for perjury is directed by the statute 1555, cap. xlvii., declaring both that offence and subornation of perjury to be punishable by confiscation of movables, by piercing the tongue, and infamy; to which the judge, in aggravated cases, may add any other penalty that he may think fit. As to the making of false declarations, see OATH. By the act 22 and 23 Vict. cap. xvii. no indictment for perjury, subornation of perjury, &c., is to be presented or found unless the person doing so has been bound to prosecute or give evidence, or the accused has been in custody or bound to appear and answer to the indictment, or unless the indictment be preferred by the direction or with the consent in writing of a judge of the superior courts, or of the attorney- or solicitor-general, or some other authorized person.

PERKIN WARBECK. See WARBECK.

PERM, an eastern government of Russia, bounded on the north by Vologda and Tobolsk, on the east by Tobolsk, on the south by Ufa and Orenburg, on the west by Viatka and Vologda, extending between lat. 56° 18′ and 61° 55′ N.; lon. 53° 30′ to 64° E.; greatest length, north-west to south-east, 520 miles; breadth, about 400 miles; area, 128,211 square miles. This government being traversed north to south by the Ural chain, is divided into two unequal portions, a western and an eastern, the former of course in Europe, and the latter in Asia. The Asiatic portion, the smaller of the two, belongs to the basin of the Arctic Ocean, which receives its waters through tributaries of the Obi. Of these the most important are the Sosva, Lobva, Tura, Neiva, Irbit, Pishma, and Iset. In the south it contains several lakes, of which the largest is the Majan. The European portion belongs to the basin of the Caspian, with exception of a small portion in the north-west, drained by the Petchora, and of course belonging, like the eastern portion, to the Arctic Ocean. By far the most important river in the European portion is the Kama, which, entering the government on the north-west, proceeds through it in a very circuitous direction, receiving numerous tributaries on either bank. Of these the largest are the Vishera, Kosa, Kosva, Obva, and Tchiusova, with its affluent the Silva. From the principal Ural chain the surface descends in a succession of parallel terraces. On the loftiest summits snow and ice continue for nine months in the year, and hence the climate, naturally rigorous from its high latitude and inland position, has its rigour greatly increased. Beyond the 60th degree regular culture becomes impossible, and the far greater part of the surface is occupied by forests and marshes. Extensive forests also stretch far into the south, and the soil being generally not very fertile, large tracts remain uncleared. The government is rich in minerals, and possesses extensive auriferous tracts, on which vast numbers of the inhabitants are employed in collecting gold; and also apparently inexhaustible beds both of iron and salt. The vast quantities of fuel required in order to work these extensively and to advantage give a great adventitious value to the timber of the forests, and make the surface covered by it of far greater value than it could be in any other form. Game both large and small is common in the forests, and many of the inhabitants gain a livelihood by hunting; fish, including both sturgeon and salmon, abound in the rivers. With exception of several branches of industry immediately connected with the mines, there are few manufactures. The chief are soap, leather, tallow-candles, potash, and glass. The trade derives great facilities from the Kama and other navigable streams, and has acquired some importance. The principal articles are metals, marble, wood, salt, fur, tallow, and tar. Nearly three-fourths of the inhabitants are Russians, and belong to the Greek Church; the rest consist of Tartars, Tcheremisses, Bashkirs, &c., and though many of them have nominally embraced Christianity, not a few are Mohammedans, and among others different forms of paganism are said to prevail. Pop. 2,476,876.

PERM, the capital of the government of the same name, on the right bank of the Kama, where it receives the Jaguschicha, consists of straight and spacious streets, and has a number of handsome public buildings, among which must be mentioned the cathedral. There are also a gymnasium, a theological seminary, a civil and military hospital. The chief employment is in connection with the iron smelting and refining works. There is a considerable trade with the inland districts. The great highway connecting Moscow with Siberia passes by way of Perm. Pop. 22,712.

PERMANENT AXIS. When the centre of gravity of a number of revolving bodies rigidly connected is in the axis of rotation the pressure produced by centrifugal force on one side of the axis is equal to the pressure on the opposite side. Sometimes these pressures are not opposite to each other, although parallel, and hence they form 'a couple,' which tends to alter the position of the axis or shaft, producing pressures at the bearings. The pressure at a bearing is evidently the moment of the above couple divided by the distance between the bearings. When there is no tendency to change the direction of the axis it is said to be a permanent axis. All axes of rotation in a steam-engine, and in machines generally, ought to be permanent axes; this axiom is of great importance in 'balancing' high-pressure, quick-moving steam-engines. Permanent axis is the name given by engineers to a 'principal axis.' See MOTION.

PERMIAN FORMATION. See GEOLOGY.

PERMUTATIONS AND COMBINATIONS. The different orders in which any things can be arranged are called their permutations. Thus the permutations of the letters a, b, c, taken two at a time, are ab, ba, ac, ca, bc, cb. It may be shown that the number of permutations of n things r at a time, is $n(n-1)(n-2)$, &c., $(n-r+1)$. Thus the permutations of six things, three at a time, are $6 \times 5 \times 4$, or 120 in number. The permutations of n things taken all together are $n(n-1)(n-2)$, &c., 2×1 in number. The 'combinations' of things are the different collections that can be formed out of them, without regarding the order in which the things are placed. Thus the combinations of the letters a, b, c, taken two at a time, are ab, ac, bc. It may be shown that the number of combinations of n things taken r at a time, is equal to the number of permutations of the n things taken r at a time, divided by the number of permutations of r things taken all together, or

$$n(n-1), \&c., (n-r+1) \div r(r-1), \&c., ..1.$$

See Todhunter's Algebra.

PERNAMBUCO, a maritime province of Brazil, bounded north by Ceará and Parahiba, east by the Atlantic, south-east by the province of Alagoas, south by Sergipe-d'El-Rey and Bahia, west by Goyaz, and north-west by Piauhy; area, 46,255 square miles. The coast-line, forming the whole of its eastern boundary, has an extent of about 120 miles; its length, from east to west, is about 530 miles. It is low and uninteresting, lined towards the sea by long and dangerous coral-reefs, and towards the interior generally well covered with wood. The country beyond gradually rises, and ultimately becomes mountainous. The climate is hot and moist, and the soil generally fertile. The principal cultivated crops are the sugar-cane and cotton, the latter extensively exported to Europe. It is chiefly the coast districts that are cultivated. The interior is either pasture-land or

covered with forests. The forests, which cover almost all the mountainous parts of the province, as well as much of the lower ground, yield inexhaustible supplies of timber, both for ship-building, carpentry, and ornamental purposes. Dye-woods also, of superior quality, and trees which distil balsams, gums, and resins of the most valuable descriptions, abound. Some gold is found, and excellent quarries of marble might be opened in several districts. Manufactures, properly so called, do not exist; but great numbers of the inhabitants are employed in the sugar-works and distilleries. The extensive export of sugar, rum, and cotton naturally leads to a corresponding extensive import, chiefly from Britain and the United States. Pop. in 1872, 841,539.

PERNAMBUCO, a town in Brazil, capital of the province of the same name, on the east coast, at the mouths of the Capibaribe and Biberibe. Its proper Brazilian name is Cidade do Recife (City of the Reef), or simply Recife, from a reef that stretches parallel to the coast between the town and the open sea. It consists of three distinct parts—Recife, occupying the south end of a small sandy peninsula, having the sea on the east, and the Rio Biberibe on the west; the quarter called San-Antonio, occupying the Isle of San-Antonio, between the peninsula and the mainland; and Boa Vista, or Sacramento, on the mainland. Recife is the principal seat of business. In it are the custom-house, the exchange, a marine arsenal, &c. San-Antonio is connected with Recife by a bridge. It has broad streets and many fine houses, and contains the episcopal palace and that of the president, the theatre, the military arsenals, and the hospital. From the island quarter of San-Antonio a bridge leads to the most westerly and newest portion of the town, Boa Vista, and having irregular streets and many of its houses surrounded with gardens. The European merchants chiefly reside here. Tramway lines run through the principal streets of the city and to the suburbs. The harbour, consisting of a natural basin, lies within the reef already mentioned, which forms a kind of breakwater, though the sea, in high storms, throws its surges partly over it. It has from 10 to 30 feet of water, but the best sheltered parts have only from 10 to 12 feet. It is defended by several forts, and is provided with a lighthouse visible at the distance of 12 miles. The principal buildings are the old Jesuits' college, now occupied as the governor's palace, the provincial legislature, and several public offices; seventeen churches and chapels, five convents, six hospitals, a town-house, lyceum, &c. The trade is extensive. The principal exports are cotton, sugar, hides and skins, and spirits; and the chief imports cotton and linen manufactures and hardware. The total value of exports in the year 1881–82 was £2,578,776; and the total value of imports, £2,697,668. Half of the trade is carried on with Great Britain. Pernambuco was founded by the Portuguese in the sixteenth century. From 1630 to 1654 it was in the hands of the Dutch, under whom it prospered greatly. It is now the third largest city in Brazil. Pop. of town and district in 1872 (the most recent census), 116,671.

PERNAU, or PERNOV, a town in Russia, in the government of Livonia, at the mouth of the Pernau, in the north-east corner of the Gulf of Riga, 102 miles N.N.E. of Riga. It is defended by a castle, and has a harbour, which, though too shallow to admit large vessels, enables it to carry on a considerable trade in flax, hemp, corn, linseed, hemp-seed, wood, and leather. Owing to the lowness of its site, prevailing winds from the south-west expose it to dangerous inundations. Pop. 12,918.

PÉRONNE, a town in France, in the department of Somme, 32 miles east by north of Amiens, on a slope above the right bank of the Somme, surrounded by extensive marshes. It is strongly fortified, and long bore the title of *La Pucelle*, from the fact of its never having been taken; but this reputation was destroyed by the Duke of Wellington, who took it by storm in June, 1815. It figures much in French history. It early had a royal palace, and several kings are buried in its church. Attached to the castle is a tower, where Charles the Simple died prisoner, and Charles the Bold was detained till he signed what is called the Peace of Péronne. It capitulated to the Germans on the 10th of January, 1871. The manufactures include woollens, cambric, leather, &c. Pop. 4174.

PÉROUSE, LA. See LA PÉROUSE.

PEROXIDES, the general name applied to the binary compounds of oxygen containing the greatest amount of that element; thus of the two oxides of hydrogen, H_2O and H_2O_2, the latter is the peroxide; of the two oxides of sulphur, SO_2 and SO_3, SO_3 is the peroxide; and so on. For an account of the individual peroxides see the articles on the various elements.

PERPENDICULAR, in geometry, a line falling directly on another line, so as to make equal angles on each side; called also a *normal line*. These lines may be straight lines or curves. A plane is perpendicular to another plane if a line drawn on one of them, perpendicular to the line of intersection, forms right angles with a perpendicular line on the other plane drawn to the same point.

PERPENDICULAR STYLE, in architecture, a variety of the pointed Gothic, the latest variety to be introduced, sometimes called the *florid Gothic*. It prevailed in England from about the end of the fourteenth to the middle of the sixteenth century. It is chiefly characterized by the predominance of straight lines in its tracery. The mullions of the windows are vertical, generally rise to the main arches, and are often crossed by horizontal bars or transoms. The mechanical simplicity of this kind of tracery enabled the architects of the period to increase the size of the windows without difficulty or danger, and large windows are accordingly another distinctive feature of this style. The tracery of the doors is similar to that of the windows. The roof of a building in this style is often among its most striking parts. There are two kinds of roof peculiar to the style—the vaulted roof, with fan-tracery, and the open timber-roof; and very beautiful examples are to be seen of both. In the former the tracery rises from the capitals of tall and slender pillars, and spreads itself out over the roof in the form of a fan. The ribs which rise in this way from the pillars are crossed by others, which correspond to the transoms of the windows, and which have the form of an arc of a circle. The outermost of the arcs which bound the tracery rising from the pillars on one side meet those which bound the tracery on the other side at one point, leaving lozenge-shaped spaces separating the arcs in the remainder of their course. One of the finest examples of this kind of roof is that of King's College chapel, at Cambridge. The largest example of the open timber-roof ever erected is that of Westminster Hall, built by Richard II. Another characteristic of the perpendicular style is the extensive use of panelling in it. The style is peculiar to England, but very common there. Nearly all the colleges of Oxford and Cambridge are specimens of it, and it is also exemplified more or less in most of the English cathedrals and principal churches.

PERPETUAL MOTION, an imaginary machine capable of moving for ever, or of doing external work for ever without the application of external energy. The idea that such a machine might be constructed was held by many eminent men in former times. After

many precious lives had been frittered away in the search for a perpetual motion, scientific men began to discourage inventors and to regard the idea as chimerical. But it was not till the discovery of the principle of conservation of energy (which see), experimentally proved by Joule, that the impossibility of the existence of a perpetual motion was considered to be a physical axiom on which a great science might be built. The modern science of energy is founded on this axiom: its principles are found to be in accordance with all physical facts. At the present day great numbers of patents for perpetual motions are taken out every year, by men who seem to be unacquainted with the most elementary and best established natural laws. The subject has held a place in natural philosophy similar to that occupied in chemistry by the search for the elixir of life, and for a method of changing the baser metals into gold.

The grand principles of the science of energy are: (1) 'The conservation of energy,' which asserts that the whole amount of energy in the universe, or in any limited system which does not receive energy from without, or part with it to external matter, is invariable; (2) 'The transformation of energy,' which asserts that in general any one form of energy may by suitable processes be transformed, wholly or in part, to an equivalent amount in any other given form. It is subject, however, to the second law of thermodynamics, and to limitations which are supplied by (3) 'The dissipation of energy.' No known natural process is exactly reversible, and whenever an attempt is made to transform and retransform energy by an imperfect process, part of the energy is necessarily transformed into heat, and *dissipated* so as to be incapable of further useful transformation.

Newton's third law of motion (see NEWTON'S LAWS OF MOTION), when stated in modern language, is the first principle of energy given above.

Now every machine when in action does work, for it is impossible to construct a machine in which there is a total absence of resistance to motion (whether this resistance is due to the rubbing together of solid bodies, to the imperfect elasticity of solids or the viscosity of fluids, to the influence of electric currents, or to varying magnetization under the influence of imperfect magnetic retentiveness), because no motion in nature can take place without meeting resistance of some sort. It is matter of every-day experience that friction impedes the action of all artificial mechanisms; and that even if bodies are detached and left to move freely in the air, as falling bodies or as projectiles, they experience resistance owing to the viscosity of the air. The frictional resistance to the tidal motions of liquids and gases in the heavenly bodies, and the frictional resistance opposed to motion by the interstellar æther, may be mentioned as known phenomena. It is evident therefore that the third law of energy given above is a statement of the impossibility of the existence of a perpetual motion.

The mechanical arrangements which have been put forward as perpetual motions by inventors are either, (1) Systems of weights, which are allowed to slide on a wheel into such positions relatively to the axis of the wheel as to produce a constant turning moment in one direction; (2) Masses of liquid moving in wheels on the same principle; (3) Masses of iron arranged on the same principle, but subjected to the attractions of magnets instead of their own weights. It would be of no use to describe even a few of these arrangements. It is sufficient to say that in every case inventors show an ignorance of the most elementary principles of natural philosophy.

PERPIGNAN, a town in France, the chief town of the department of Pyrénées-Orientales, on the right bank of the Tet, 78 miles south-west of Montpellier. It is surrounded with lofty walls, flanked with bastions, and defended by a citadel occupying a height which completely commands the town. Guarding the entrance from Spain into France by the East Pyrenees, it has been fortified with the greatest care by the most celebrated engineers, and ranks as a fortress of the first class. The streets are narrow, and almost covered over in many places by the wooden balconies of the houses, which are Moorish in structure. Almost all the public buildings date from the period of Spanish rule, and are either of brick or rounded pebbles. The principal is the cathedral, founded in the fourteenth century. It is the see of a bishop. Its manufactures are broadcloth and other woollen stuffs, playing-cards, candles, chocolate, leather, &c.; and it has a trade in wine, brandy, honey, fine wool, oil, iron, silk, cork, and some other products of the south. It was formerly the capital of the province of Rousillon, and was not united to France till the Treaty of the Pyrenees in 1659. It still bears strong indications of its having long been under Spanish rule. Pop. (1881), 31,735.

PERRAULT. Of four brothers of this name, who lived during the reign of Louis XIV., the most known are CLAUDE (born 1663, died 1688), a physician, naturalist, and architect, from whose designs the celebrated façade of the Louvre, and the observatory at Paris, were built; and CHARLES (born 1628, died 1703), a man of erudition, but of little taste, whose verses have not outlived his day. Colbert availed himself of their assistance in founding the French Academy of Art, of which Charles was the librarian. His poem, Le Siècle de Louis le Grand, which he read before the Academy in 1687, gave rise to the famous controversy on the comparative merits of the ancients and moderns. In his Parallèle des Anciens et Modernes (1688–96), in the form of a dialogue, he maintains that the moderns have carried art and science, which were in a state of infancy among the ancients, to the highest perfection, and have excelled them in their works. This opinion was warmly attacked by Boileau, and zealously defended by Fontenelle and Hudart de la Motte. Perrault was also author of Les Hommes Illustres du XVII^{e} Siècle (1696–1700). His Contes de ma Mère l'Oye (Tales of Mother Goose) have procured for him the title of 'inventor of the French Fairy Tales,' and have secured for him a more enduring reputation than any of his other works. See FAIRIES.

PERRON, ANQUETIL DU. See ANQUETIL DU PERRON.

PERRY. See PEAR.

PERSECUTIONS OF EARLY CHRISTIANS. Ten of these are usually counted, a number fixed by the ecclesiastical writers of the fifth century. In this number are included only those which are represented as having been so widespread throughout the Roman Empire as to entitle them to be called general. The persecutions which the early Christians underwent at the hands of the Jews were a natural consequence of the anxiety which the free spirit of the Christian doctrine and worship, so opposite to the religious institutions previously existing, excited among Jews and heathens. As long as the Jewish state continued the Christian communities established within its limits had little reason to expect toleration, as even the Founder of their religion had been regarded as a stirrer up of sedition, on account of his opposition to the ordinances of the Jewish Church, which were zealously defended by the Pharisees, who formed the ruling party; and the sanhedrim could not forgive his followers for regarding him as the true Messiah. But as this body had not the power to carry its wishes into effect, and the Christians abstained from open violation of the public

peace, there was no general persecution of them in Palestine under the sanction of the Roman authorities; and only some of the heads of the congregations at Jerusalem, such as Stephen, and the apostles James the elder and James the younger, suffered martyrdom—the former forty-three the latter sixty-three years after Christ. But the Jews, in the towns of the Roman Empire, where they had made settlements, and where Christian congregations soon sprung up, excited against them the suspicions of the magistrates, who at first may have considered the Christians as an unimportant Jewish sect, or have tolerated the new worship with less reluctance since the introduction of a new divinity had little in it to startle the mind of a heathen. Nero, indeed, ascribed to the Christians the conflagration of the city of Rome, kindled by himself, and in the years 64–68 subjected them to a dreadful persecution, in which the apostles Peter and Paul suffered; but this was more an exercise of imperial tyranny, taking advantage of the popular odium and suspicion which the Christians had excited against themselves, than an outbreak of religious intolerance. This *first persecution* does not appear to have extended far beyond Rome. There arose, however, a *second*, in 95–96, because Domitian, deceived by the royal title which the Christians gave to Jesus, after fruitless inquiries for the supposed relations of Jesus and pretenders to the crown, caused many of his followers, particularly in Asia Minor, to be banished or put to death. It was during this persecution that St. John is usually supposed to have been banished to the Isle of Patmos.

What is called the *third persecution* of the Christians took place in the time of Trajan, who issued an edict against secret societies, which was followed, in 105, by a prohibition of their meetings, and the punishment of some refractory individuals, because the Roman proconsuls (for example, Pliny the younger, in Bithynia) considered the refusal of the Christians to pay the usual homage to the image of the emperor as deserving of punishment; and their suspicions were awakened by the independent character of the followers of the new faith, and their deviation from the national customs. Charges of outrage and sedition, principally excited and spread abroad by the Jews, increased the unfavourable disposition of the heathens towards the Christians. It was said that they were accustomed, in their assemblies, to eat human flesh (a misconception of the eucharist), and to practise shameful vices, and not only to aim at the destruction of the old religion, but at the overthrow of the Roman imperial throne, and the foundation of a new monarchy. These reports easily grew out of their peculiar habits. The obscurity in which they enveloped themselves, on account of their well-founded apprehensions; the spirit of their associations, which kept them separate from the rest of the world; their secret meetings for religious exercises, often held by night—were sufficient to furnish materials for suspicion; and the extravagant expectations which many among them entertained of the near return of Christ, their zeal against heathen manners and customs, and their open opposition to the worship of idols, from which they annually converted thousands, excited the heathen priests and magistrates against all that bore the name of Christian. Yet the followers of the new religion, belonging usually to the humbler classes of society, did not necessarily come into direct collision with the authorities, who for the most part regarded them with disdain. To this circumstance, next to the protection of an overruling Providence, is principally attributable the fact that, notwithstanding several occasions for new persecutions, and notwithstanding the zeal with which their doctrines were assailed by heathen philosophers (as, for example, Celsus, who wrote against Christianity about 140), they enjoyed above fifty years of undisturbed tranquillity, until the fourth persecution so called. In Asia Minor they were violently assailed, about the year 160, by the heathen populace; and the Christian apologist, Justin Martyr, and the Bishop of Smyrna, Polycarp, were put to death. About the year 177 Marcus Aurelius treated the new congregations in Gaul, at Vienne and Lyons, with great severity, and many Christians suffered martyrdom (*fourth persecution*).

About the end of the second century a strong disposition was manifested to unite the congregations which had been hitherto independent of one another into one church. The spiritual teachers, too, growing bolder with the increase of their distinctions and privileges, showed a disposition to grasp more authority, and often came into collision with the civil magistrates; and the Christians, having become numerous and powerful, openly derided the Pagan worship, now sinking into decline. These circumstances led to wild outbreaks of the heathen populace bent on revenging the insults offered to their gods (about 192), and a dreadful slaughter ensued. The Emperor Septimius Severus moreover in 202 forbade the accession of new converts to the Jewish and Christian religions, and this decree was followed by the fourth persecution and still severer oppressions of the Christians during the rest of the reign of Severus, which lasted till 211. The punishment of death was not, however, commonly inflicted. Most frequently the Christians were sentenced to banishment or compelled to work in the imperial mines. When death was decreed it was in many cases in consequence of the burning desire which the victims themselves cherished for such an end.

After the death of Severus the Christians under Caracalla, Macrinus, and Heliogabalus, and under Alexander Severus, enjoyed toleration and peace, and even privileges and distinction. The restraints imposed upon them by the Emperor Maximian (235–238) received the name of the *sixth persecution*, although, properly speaking, only Christian teachers and ministers were persecuted by this emperor; and the oppressions which many of the congregations underwent were inflicted without his command. Private hatred, in fact, often led to outrages against the Christians, and excited the populace to assail them. This happened at Alexandria in the latter years of the reign of the Emperor Philip the Arabian, who was personally well-affected towards them. But his successor Decius began his reign (249) with a persecution of the Christians (the *seventh*) throughout his kingdom. This was the first really general persecution. Its universality and the perseverance and cruelty with which it was pursued made it plain that the emperor's purpose was to extirpate them entirely, and induced many to fall from their faith. Fortunately, however, from the rapid changes in the government at this period, the persecuting policy was not very steadily followed. Valerian in 257 put to death few but the clergy (*eighth persecution*); and the execution of the edict of Aurelian against the Christians (274)—the *ninth persecution*, as it was called—was prevented by his violent death. A severe persecution (the *tenth*) took place under the Emperor Diocletian at the instigation of his ministers, Galerius, and other enemies of the Christians in 303. Throughout the Roman Empire their churches were destroyed, their sacred books collected and burned, and all imaginable means of inhuman violence employed to induce them to renounce their faith. As they were accused, moreover, of a rebellious spirit, and of kindling a conflagration in the royal palace at Nicomedia, thousands suffered martyrdom. Constantius

Chlorus, a sovereign favourable to them, was unable to protect them entirely in his Gallic and British provinces; and in Greece, Illyria, Italy, and Spain Galerius, Maximinus, and Licinius pursued them with imprisonments and executions, principally directed against the clergy, till 310. These were the last oppressions of the Christians under the Roman government. Constantine the Great (312 and 313) restored to the Christians full liberty and the use of their churches and goods; and his conversion to Christianity made it the established religion in the Roman Empire.

There has been a good deal of controversy as to the real extent and fatality of the early persecutions of the Christians. Dodwell and Gibbon have shown beyond a doubt that the accounts which some classes of writers are in the habit of giving of them are greatly exaggerated, but, on the other hand, more recent investigations have shown that these two writers have gone to the other extreme and greatly underestimated the violence of the persecutions.

Christians themselves, after it had become a crime to be a heretic (see HERETIC and INQUISITION), persecuted one another most bitterly; and the outrages which the early Christians had suffered from the heathens were tolerable compared to the religious wars which they waged against each other in the middle ages and to the sufferings inflicted on *heretics*, so called, by the Inquisition and by fanatical princes even to the eighteenth century. But as heathen Rome could not stop the spread of Christianity, so Protestantism in later times rooted itself the more firmly in proportion to the tempests which assailed it, for the direct tendency of persecution is to awaken a spirit of heroic resistance and a zeal to make sacrifices for the cause of truth.

PERSEPHONĒ (Latin, *Proserpina*, Anglicized *Proserpine*), according to some the daughter of Zeus and Styx, or, according to the more usual tradition, the daughter of Zeus and Dēmētēr (Ceres). Pluto carried her off, with the consent of Zeus, and made her his wife. This fable has been treated by several poets and adorned in different ways. In Homer, where she bears the name of Persephoneia, no mention is made of her having been carried off by Pluto against her will. She is simply represented as the majestic and awful wife of Pluto and queen of the lower world. According to the Homeric hymn to Dēmētēr Persephonē was once dancing in the choir of nymphs led by Athēna and Artemis in a grassy meadow. Leaving the dancers she went with some of her companions to gather flowers. At the prayer of Pluto, and with the consent of Zeus, the earth produced 100 blooming narcissuses from one root, and gods and men were astonished at their beauty and delighted by their odour. The maid eagerly gathered them, and, beguiled by their magic power, she wandered from her companions. Suddenly the earth opened, and Pluto rose from the chasm with his immortal steeds, seized Persephonē, and carried her in a golden chariot to the lower world. She called loudly on her father for protection, but in vain; no one heard her cries except Hecatē and the Sun. Claudian is still more circumstantial in his account. He sings that the beauty of Persephonē had inflamed all the gods with love, particularly Ares and Apollo. In order to deliver her daughter from the importunities of her lovers Dēmētēr concealed her in a cavern in Sicily, where, with her nurse Calligena, she was watched by dragons. Pluto begged her of Zeus for a wife; he consented, and ordered Aphroditē to entice the maid out of the cavern by artifice. Artemis went to Sicily in company with Aphroditē and Athēna, and not finding the watchful mother at home they easily persuaded the girl to go to walk. She went out, therefore, in company with the nymphs and zephyrs to pluck flowers in the blooming fields. Suddenly the earth opened, and Pluto bore the astonished maiden to the lower world, while Zeus signified his approbation by his thunder. In vain did Zeus attempt to obtain her mother's consent to her marriage with Pluto, and he at length granted her permission to return to the upper world provided she had not tasted any of the food of the gods. But while walking through the lovely fields of Elysium she had eaten a pomegranate, and all that Zeus could grant to the prayers of her afflicted mother was that she should spend the spring and summer of each year in the upper world. See DĒMĒTĒR.

The chief seats of the worship of Persephonē were Attica and Sicily, although her worship was not wholly neglected in any part of Greece or in any of the Greek colonies. Sometimes she shared the honours paid to her husband, sometimes those paid to her mother, and sometimes particular celebrations were dedicated to her alone. In Attica she bore the name of Korē, that is, the daughter, namely, of Dēmētēr, who is sometimes called Hē Mētēr, the mother, and the Eleusinian mysteries, held in September, were sacred to both. A festival held in the month of Anthesterion (February) was in honour of Persephonē alone. In the festivals held in her honour in autumn all the visitors were dressed in mourning in token of lamentation for her being carried off by Pluto, while at the spring festivals they were clad in gay attire in token of joy at her return. The chief localities in Sicily which were held sacred to Persephonē were Agrigentum and Enna, from the fertile plain surrounding the latter of which places the later traditions, adopted by Milton, represented her as having been carried off. In works of art Persephonē has the appearance of a grave and severe divinity. She is sometimes represented as sitting by the side of her husband, and sometimes alone. The story of Persephonē in the simple form in which it is given by the Greek poets is universally held to be a mythical account of the changes of the seasons, and this interpretation is so obvious that the ancients themselves saw in the abduction of Persephonē a symbol of autumn, when the fruits of nature disappear, and in her return a symbol of spring. This idea of the myth is beautifully worked out in Schiller's ballad called Klage der Ceres. In the Orphic mysteries Persephonē is a prominent figure, but there she bears a mystical character very unlike that ascribed to her by the earlier mythology. She is in them represented as a native goddess, who produces and destroys everything, and is hence closely associated or even identified with other mystical goddesses such as Rhea, Isis, Artemis, Hecatē, &c. This Persephonē of the mysteries is also said to have been by Zeus, the mother of the mystic Bacchus, also called Jacchus, Sabazius, and Zagreus, although the mythological story makes her childless.

PERSEPOLIS, one of the chief cities of the ancient Persian Empire. It was situated in Persia Proper, the southern part of the modern Kingdom of Persia, in a fertile plain, at the foot of a plateau now called Merdasht, and watered by the Araxes (Bendemir). It was founded by Cyrus, or, according to others, by Cambyses, and was looked upon as one of the capitals of the empire, although seldom used as a royal residence. It seems to have been chiefly used as a burial-place for the kings (as was also Pasargada, the ancient capital of Persia Proper) and as a royal treasury. This circumstance rendered it the richest town in Asia at the time of its being taken by Alexander the Great (B.C. 331). After its capture it was given up to pillage, only the citadel containing

the royal palace and treasury being reserved. This citadel was surrounded by three walls of granite pierced with gates of brass. The outermost wall was 16 feet high, the middle one 48 feet, and the innermost one 60 feet. Alexander is said to have set fire to the palace with his own hand at the conclusion of a revel, being urged to do this by a courtezan, Thais, in order to revenge the burning of Athens by Xerxes; but the town was far from being completely destroyed, as some historians have asserted, since Alexander returned to the town after the expedition to India. In the middle ages the town was, under the name of Istakhar, the residence of the Sassanidæ, and afterwards of the Mohammedan princes, as is proved by the inscriptions in Pehlevi and Persian which are found alongside of the cuneiform inscriptions of the first empire. At the present day the ruins of Persepolis are called by the Persians Takht-i-Jemshid (Throne of Jemshid) or Chil-Minar (Forty Columns). These columns are the remains of a magnificent edifice constructed in marble obtained from the neighbouring mountains. It was built with stones of enormous size, which were placed above one another without the intervention of lime, and with so much skill that it is difficult to discover the joinings. The columns are fluted, and are 50 feet high and about 16 feet in circumference. The temples are quite peculiar in their architecture. The site and the courts of the palace are cut in a mountain of marble. Fabulous animals 21 feet in length and 19 feet in height appear to guard its entrance. They have wings, the body of a lion, the feet of a horse, and the head of a man, crowned with a tiara and adorned with a curled beard. There are bass-reliefs representing processions and religious ceremonies. The sculpture is superior to that of the Egyptian monuments, the details of form indicating knowledge of anatomy and a mastery of the chisel which were only surpassed by the artists of Greece.

PERSEUS, an Argive hero, son of Danaë and Zeus, and grandson of Acrisius. In consequence of an oracle which had foretold that Acrisius would die by the hands of a son of Danaë (see DANAË) he was sent to sea on his birth, in a chest along with his mother. But the chest reached the Island of Seriphos, and on being opened both mother and son were found to be alive. Dictys, a fisherman who found them, conveyed them to his brother Polydectes, the king of the island, at whose court Perseus was brought up. Polydectes at first treated Perseus with kindness, but when he was grown up he became anxious to get rid of him, as he thought he would prove an obstacle in the way of his gratifying a passion which he had conceived for his mother Danaë. Under pretence, therefore, of suing for the daughter of Œnomaus, he requested from his friends presents of rarities to make his wedding feast more splendid; and when Perseus professed willingness to bring him anything that he desired, even the head of the Gorgon Medusa, bade him bring what he had mentioned. Beyond the ocean, just on the borders of eternal night, dwelt the formidable Gorgon race, with serpent-locks and serpent-girdles, of whom Medusa alone was mortal. Conducted by Hermes and Athena he first went to the three Graiæ, on the western coast of the ocean; who had but one eye and one tooth in common. Perseus got possession of these, and promised to restore them on condition that they would bring him to the nymphs, who kept the instruments which he needed in this enterprise—the talaria, or winged shoes, the bag, and the helmet of Pluto, which made its wearer invisible. They agreed to the condition, and Perseus obtained from the nymphs what he desired. Led by Hermes and Athena he reached the slumbering Gorgons. With his face averted he approached the monsters, whose look transformed the spectator into stone, saw the head of Medusa by reflection in his brazen shield, and cut it off. From the drops of blood sprang Pegasus and Chrysaor. With the head in his bag he escaped from the pursuing sisters, by means of the helmet of Pluto. On the winged sandals of Hermes he now hovered over various regions, seeking adventures. He went to King Atlas, who had been informed by an oracle that a son of Zeus would strip his garden of the golden apples which it bore, and therefore refused to Perseus the rites of hospitality, who, presenting to his eyes the Gorgon's head, changed him into a rock, which was doomed to support the heavens. He then delivered Andromeda. (See ANDROMEDA.) By her he became the father of Perses, whom he left in the care of his grandfather Cepheus, and returned with Andromeda to Seriphos. Here he found his mother at the altar of Athena, to which she had fled with his foster-father Dictys, to escape the violence of Polydectes. He transformed the latter, with all his associates, into stone; and having placed Dictys upon the throne of Seriphos, he returned to Hermes the talaria, the bag, and the helmet, and gave to Athena the Gorgon's head, which she fixed in the centre of her shield, or, according to some, on her breastplate. Perseus then went to Argos with Danaë and Andromeda, to visit his grandfather Acrisius. To avoid the predictions of an oracle Acrisius had fled to Thessaly; but he could not escape his destiny, for Perseus followed him there, and killed him accidentally with the discus, of which he was the inventor. In consequence of this event he refused to ascend the throne of Argos, which had thus fallen to him, and exchanged it for Tiryns, the kingdom of Megapenthes. Here he founded Mycenæ. Besides Perses, to whom the kings of Persia traced their origin, Andromeda also became the mother of Alcæus, Sthenelus, Heleus, Mestor, Electryon, and two daughters named Gorgophone and Autochthe. After his death Perseus was worshipped as a hero, and placed among the stars.

PERSEUS, the last king of the Macedonians, and an illegitimate son of Philip V., succeeded his father B.C. 178, and with the view of extending the limits of his kingdom entered keenly into the hostilities which had previously broken out against Rome. He sought also to form alliances with the Greeks, Thracians, Illyrians, and other nations, but the negotiations failed, partly through his indecision, avarice, and cruelty. The Roman senate, on being informed of the scheme of Perseus by the crafty Eumenes, king of Pergamos, sent an army against him 171 B.C. The first three campaigns had no decisive result, but at last Lucius Æmilius Paulus, having taken the command of the Roman forces, succeeded, B.C. 168, in gaining a signal victory at Pydna, which enabled him to complete the conquest of Macedonia. Perseus, even at the commencement of the battle, fled off to Samothrace, but was given up to the Romans, and some years after died in captivity at Alba.

PERSEUS, a northern constellation of Ptolemy, exceedingly rich in objects of interest. In a good telescope the double cluster in the Sword-handle appears wonderfully rich in stars. Perseus contains the variable star Algol.

PERSEVERANCE, or FINAL PERSEVERANCE, one of the peculiar doctrines of Calvinism, which, considering that all the arrangements for the salvation of any individual have been absolutely fixed from eternity, necessarily infers that after the work of salvation has actually been commenced, it will be carried forward without fail to a successful termination, though by means not inconsistent with human freedom.

PERSHORE, a market town in England, in the county of Worcester, and 9 miles S.S.E. of the town of Worcester, on the right bank of the Avon. It has two churches, of which that of the Holy Cross consists of a portion of the old abbey of Pershore, and is a noble structure. Immense quantities of fruit and vegetables are raised in the vicinity for the markets of Birmingham, and other large manufacturing towns. Pop. (1881), 2885.

PERSIA (Persian, *Iran*), a kingdom of Western Asia; bounded north by Transcaucasian Russia, the Caspian, and Russian Central Asia; east by Afghanistan and Beloochistan; south by the Persian Gulf; and west by Asiatic Turkey; greatest length, north-west to south-east, 1200 miles; greatest breadth, north-east to south-west, 850 miles. It is divided into the provinces and districts of Azerbijan, Ghilan, Mazanderan, Astrabad, Ardelan, Irak-Ajemi, Khorasan, Khuzistan, Farsistan, Luristan, Kerman, Laristan, together with Seistan and Kohistan, recently gained from Afghanistan, and part of Mekran from Beluchistan; total area, 636,000 square miles. Pop. about 7,653,600. Principal towns, Teheran, the capital; Meshed, Ispahan, Tabreez, Yezd, Kermanshah, Kerman, Hamadan, Urumia, Shiraz, &c.

General Features.—Persia belongs to the vast and elevated table-land which, commencing in the west, on the eastern frontiers of Asiatic Turkey, stretches east without interruption into Afghanistan, and thence to the borders of India. The west part of this table-land forms the far larger portion of the Persian dominions. To the east, where it is only politically separated from Afghanistan, Persia does not possess any natural boundaries: but has its limits in other directions well defined by lofty mountain ranges, which descend, with more or less rapidity, on the north towards the Caspian, on the west towards the plains of the Tigris and Euphrates, and on the south towards the Persian Gulf. Persia may thus be described in general terms, as consisting of an extensive central plateau, occupying at least three-fourths of the whole surface; a series of mountain chains encircling the plateau on all sides except the east; and an outer border, of more or less width, consisting for the most part of gentle slopes, low valleys, and level plains. The east part of the plateau forms the great deserts of Khorasan and Kerman, and is one of the most desolate regions of the globe. Towards the west the plateau improves in appearance. Saline incrustations are there of less frequent occurrence; the quality of the soil improves, and the surface, being both more diversified and more broken by lofty heights, obtains more moisture, and can be successfully cultivated.

Mountains.—These have already been referred to as forming the lofty barriers which encircle the central plateau. The north chain, commencing far east at the Hindu Kush, by which it becomes linked to the Himalayas, traverses Afghanistan, and enters Persia on its north-east frontier, near lat. 61° N., west of the town of Herat. Here it forms a mountain region, in some parts 200 miles wide, though in general much narrower, and under the name of the Mountains of Khorasan proceeds across the north of the province of that name. It then enters the province of Mazanderan, on the south of the Caspian, where it takes the name of the Elburz Mountains, and shortly after on the borders of the provinces of Mazanderan and Irak-Ajemi, attains in Mount Demavend the height of 20,000 feet. The Elburz chain, which many consider as terminating nearly opposite to the south-west corner of the Caspian, is succeeded by the Massula Mountains, and then by Mount Sevellan, which, attaining the height of 12,000 feet, throws out numerous ramifications, by which it becomes linked with the mountains of Ararat. These, which, in the celebrated mountain of same name, situated as a common property on the borders of Russia, Persia, and Turkey, possess the loftiest summit of Western Asia, form the common link by which the north and the west ranges of Persia are united. The latter, commencing in the north-west, in the mountains of Kurdistan, is continued south in a broad and elevated belt till it reaches lat. 34° N.; then it changes its direction to south-east, and under the names of the Mountains of Laristan, Awa, Bakhtiyari, and Farsistan, spreads out and forms several separate ranges. One of these, proceeding east between the provinces of Farsistan and Laristan, and across the province of Kerman, forms the south range separating the great plateau from the shores of the Persian Gulf. It is more remarkable for its length and width than for its elevation, which apparently never rises above 1000 feet higher than the plateau forming its base.

Rivers and Lakes.—Considering the extent of Persia, its rivers are both few in number and insignificant. Not one of them is of any navigable importance, except the Euphrates; and even it cannot well be called a Persian river, as it only waters a small portion of the south-west frontier. Its important tributary, the Kerkhah, however, has its whole course in Persia. The Karun, rising to the west of the Kerkhah, pursues a course nearly parallel to it, and after receiving several considerable affluents falls into the north-west extremity of the Persian Gulf, which, from that point east, though extending for several hundred miles, and forming the only basin for the south drainage of Persia, does not receive a single stream deserving of notice. The streams which flow northwards into the Caspian are, likewise, all inconsiderable, except the Kizil-Uzen or Sefid Rud (White River), which, rising in the mountains of Kurdistan, has found, or worn for itself a channel, generally several hundred, and sometimes 1000 feet below the general level of the table-land in which the first part of its course is performed; it then bursts its way across the Mountains of Massula, into a long valley, interposed between two of its ranges; and finally works its course to the Caspian across the Elburz, at the celebrated Rudbar Pass, after a course of about 350 miles. Almost all the fresh-water lakes which Persia possesses are situated in the province of Mazanderan. They are numerous, though individually of limited extent. The salt lakes, on the contrary, are few in number, but remarkable for their magnitude. The principal are Bakhtegan or Niriz, in the east of the province of Farsistan, and Shahee or Urumia, in the west of the province of Azerbijan. The great salt swamp Hamoon or Zurrah is now partly in Persia partly in Afghanistan and Beluchistan.

Geology and Minerals.—The geological structure of Persia has not yet been carefully and completely explored. The whole of the interior, with very few exceptions, appears to be occupied by strata belonging to the tertiary formation. On the east a belt of secondary strata stretches north to south, and on the west a similar belt has been traced among the mountains, which there form the boundary of the great plateau. Granite and crystalline schists form great part of the mountains which extend from Laristan east across the south of Kerman into Beluchistan. The same rocks are more largely developed in the mountain ranges of the north, where, besides forming the nucleus of the principal axis, they cover a considerable width, both on the north and on the south slopes, and along the base. The only remarkable interruption to the continuity of the granites and schists of the north is in the chain of the Elburz,

in which the effects of remote volcanic agency are strongly manifested. The rocks which bound the alluvial plain of Lake Urumia on the west, are also volcanic. The most celebrated of the mineral products of Persia is the turquoise, the most valuable mines of which, producing gems of surpassing beauty and in considerable quantities, are in the vicinity of Nishapur, to the west of Meshed. Among the metals, iron, argentiferous lead, copper, and antimony are said to be abundant, though they have not yet been turned to much account. Rock-salt may be obtained in unlimited quantities in almost every quarter, and sulphur is dug almost solid from the crumbling cone of Mount Demavend. Naphtha is found in many places; a celebrated gum or bitumen, called *mumea*, is collected in Farsistan. Marble of the finest quality is quarried in Azerbijan.

Climate.—The extremes of heat and cold are most sensibly felt on the central plateau, where the winter is as rigorous as the summer is hot. The dryness of the atmosphere, however, makes the air generally pure, and the sky cloudless. The shores of the Persian Gulf are scorched up in summer by a burning heat, and become so unhealthy that all the inhabitants who have the means abandon them, and retire to the adjacent mountains. On the southern side of the northern mountain ranges snow falls early in November. In such situations as at Teheran ice is seen up to the middle of March; cold winds from the north prevail in April, and even during summer great and sudden changes of temperature are not uncommon. On the northern side of the mountains, in the plains of Ghilan and Mazanderan, the climate is like that of a tropical region, in which a dry and a rainy season regularly alternate, and vegetation has a luxuriance not often met with in much lower latitudes.

Vegetation, Agriculture, Zoology, &c.—The general barrenness of the interior of Persia, particularly in its eastern and southern regions, has already been referred to. The long belt of sandy shores which line the Persian Gulf is nearly as barren as the desert table-land, but is often interspersed with plantations of date-trees, which here find a genial climate, and grow to great perfection. Among the mountains in the south-west forests of oak and other trees are not uncommon, though in general they are stunted in their growth, and degenerate into a low jungle. The only true forest-land of Persia is the north side of the lofty ranges which overlook the Caspian. There all the mountain sides are covered with dense and magnificent woods of oak, beech, elm, and walnut, intermingled with box-trees, cypresses, and cedars. Lower down, though still at some thousand feet above sea-level, wheat and barley are extensively cultivated. In the level and rich plains below, vegetation of every kind is remarkably luxuriant. The sugar-cane and orange come to perfection, and are common; the pomegranate grows wild, the cotton-plant and mulberry are extensively and successfully cultivated, large tracts are occupied by the vine, and orchards, loaded with exquisite fruits—figs, apricots, peaches, plums, cherries, apples, and pears—occur in every quarter. Even the swampy shores of the Caspian are covered with a tall growth of saline plants and canes, available for building and many other domestic purposes. In these low plains the only grain under extensive and regular culture is rice; and the principal subsidiary crops are cotton, indigo, sugar, madder, and tobacco. Another rice district of large extent occurs in Azerbijan, where large rice fields, producing rich crops, occupy the greater part of the low flats which surround Lake Urumia. Irrigation is well understood and extensively practised, and on lands apparently of no great fertility good returns are by this means obtained. In the more pastoral districts, and more especially on the fertile slopes and plains at the foot of the north side of the Elburz chain, where luxuriant meadows are often seen, considerable attention is paid to the dairy. The stock, however, is generally of an inferior description, though black cattle, of great size and beauty, distinguished by the Indian hump, are not uncommon in Mazanderan. Sheep and goats are much more numerous. The former, chiefly of the large-tailed variety, furnish the far greater part of the animal food which is used, and no inconsiderable portion of the clothing; the wool being not only extensively spun and woven, but often allowed to remain on the skins, which are formed at once into cloaks and jackets. The latter, particularly in the province of Kerman, yield a wool little inferior to that of Cashmere. The other domestic animals are asses, generally of a large and superior description; mules, remarkably strong, hardy, and sure-footed, and used more than any other animal for transport; horses, much improved by crossing with those of Arabia, and famous for strength, speed, and beauty; and camels. Among the birds are pheasants, frequenting the plains on the south-east corner of the Caspian; pelicans and bustards along the sandy shores, and often far in the interior of the deserts; blackbirds, thrushes, and other well-known songsters, but more especially the bulbul or eastern nightingale. Among destructive insects the locust is noted for the fearful ravages which it often commits. Fish abound only in the Caspian, and on the shores of the Persian Gulf. At the mouths of the streams which fall into the former valuable sturgeon fisheries are carried on, chiefly by Russia. The rivers contain few fish; and Urumia, the largest of the lakes, is wholly destitute of them.

Manufactures, Trade, and Communications.—The manufactures of Persia are more numerous than important, though in a few articles they continue to retain some of the celebrity which they acquired in early times. Among them may be mentioned various kinds of silk goods, as taffetas, velvets, and brocades, made extensively at Ispahan, Kashan, Astrabad, Yezd, and other places, not only for home consumption, but export, particularly to Turkey and Russia; carpets and felts in Khorasan and many of the central districts of Irak-Ajemi; Arabian cloaks and woollen stuffs, made in Khuzistan, and in large demand in the country, as well as Arabia; shawls, in imitation of those of Cashmere, made of the fine wool of the goats of Kerman; the fire-arms of Kermanshah; the swords, daggers, and other cutlery of Ispahan, Shiraz, and Meshed; the copperware of Kashan, the gold brocades of Ispahan. Coarse woollens and cottons, once made to a very great extent for the clothing of the poorer classes, have in numerous instances been entirely supplanted by the cheaper and better products of Great Britain and Russia. The internal trade is almost entirely carried on by caravans. Tabreez is the chief seat of the Persian commerce, being the emporium for the productions of Northern India, Samarcand, Bokhara, Cabul, and Beluchistan. European merchandise reaches Tabreez by way of Constantinople and Trebizond, being brought from the latter place by caravans. The roads are few and bad, and this state of matters is so great a hindrance to the internal trade that the country is often visited by cruel famines. That of 1871–72 was one of the most terrible that have ever taken place, and greatly reduced the population in the chief centres, especially in the fertile province of Ghilan. For a short time after his visit to Europe in 1873 the shah Nassr-ed-din showed a disposition to promote the development of the resources of Persia. On the occasion of that visit he granted to the German Baron Reuter concessions for the construction of railways,

Under Artaxerxes Longimanus (465–425) the war with Greece is said to have been concluded by the Peace of Cimon (see GREECE); and it is at least the case that hostilities now ceased for a time, the advantage remaining with Greece. All the preceding Persian kings are supposed to be mentioned in the Bible, but not in most cases under names by which they can be at once identified. The following is the result of one of the attempts of recent scholarship to effect this identification. With Cyrus there is no difficulty, as he is always mentioned under his own name. Cambyses is taken to be the Ahasuerus of Ezra iv. 6; Gomates to be the Artaxerxes of Ezra iv. 7; Darius, the son of Hystaspes, the Darius mentioned in Ezra iv. 5, 24; v. vi.; Xerxes, the Ahasuerus of the book of Esther; and Artaxerxes Longimanus the Artaxerxes of Ezra vii. and of the book of Nehemiah. The next two changes of government after Artaxerxes Longimanus were rapid and violent. Xerxes II., his only legitimate son, was murdered, after a reign of forty-five days, by his natural brother Sogdianus, who suffered the same fate seven months afterwards by the hands of Ochus, another illegitimate son of Artaxerxes. On assuming the throne (424 B.C.) Ochus took the name of Darius, whence he is usually known as Darius II. or Darius Nothus, that is, the Bastard. He was a weak prince, and was governed by favourites and by his wife Parysatis. The revolts of his satraps hastened the decline of the empire, and the Persians were obliged to acknowledge independent kings in Egypt. But the internal troubles in Greece, of which the Persians artfully took advantage, saved them for a time from a united attack by the Greeks. Darius Nothus was succeeded in 405 or 404 B.C. by his son Artaxerxes II., Mnemon, who was entirely under the influence of his mother Parysatis. His brother Cyrus, supported by 10,000 Greeks, attempted to dethrone him (400 B.C.), but was defeated and killed. During his reign the Lacedæmonians had renewed the war with Persia, and had obtained several advantages in Asia Minor; but domestic dissensions ultimately obliged them to yield the victory to the Persians, and to conclude the dishonourable Peace of Antalcidas (387 B.C.) Artaxerxes Mnemon reigned till 359 B.C., and was succeeded by his son Artaxerxes III., Ochus, who secured the throne by putting to death his numerous brothers. He recovered Egypt (350 B.C.); but his eunuch Bagoas poisoned him on account of his cruelty (338 B.C.), successively murdered all his sons, and gave the crown to Darius Codomannus, a prince of the blood, who was conquered by Alexander the Great in three decisive actions on the Granicus, at Issus, and Gaugamela, and lost his life (330 B.C.); after which Alexander made himself master of the whole empire. On the dissolution of the Macedonian Empire, after the death of Alexander (323), Persia ultimately fell to the Seleucidæ (312), who reigned over it till 236 B.C., when Seleucus Callinicus was defeated and taken prisoner by Arsaces I., the founder of the dynasty of the Arsacidæ and of the Parthian Empire, of which Persia formed a portion, and which lasted till 226 A.D. The supremacy was then recovered by Persia in the person of Ardishír Babigán (Artaxerxes), who obtained the sovereignty of all Central Asia, and left it to his descendants, the Sassanidæ, so called from Sassan, the grandfather of Ardishir. This dynasty continued to reign for upwards of 400 years, at the end of which period Persia fell under Mohammedan rule. With it begins, according to Hammer, the romantic character of Persian chivalry; and the most renowned rulers of the dynasty are the subjects of Persian romances. The reigns of the separate sovereigns of this dynasty are variously dated by different authorities. The dates adopted by us are those of Smith. Ardishír ruled from 226 to 240. The wars which he carried on with the Romans were continued under his successor Shapúr (Sapor I., 240–273) against Gordian and Valerian (the latter of whom fell into the hands of Sapor, and was treated in a most revolting manner), and were not terminated until the peace of King Narsi or Narses (294–303) with Diocletian. Narses was the seventh king of the dynasty. The four who intervened between Shapúr and him were Hormúz (Hormisdas, 273–274), Bahram (Varanes I., 274–277), Bahram (Varanes II., 277–294), and Bahram (Varanes III., 294). The successor of Narses, Hormúz (Hormisdas, 303–310), had an uneventful reign; while that of the next king, Shapúr (Sapor II., called the Great, 310–381), was perhaps the most notable of the whole dynasty. Sapor II. was still unborn when his father died, and during his minority the empire was weak; but when he became of full age he made it more powerful than it had ever been since the time of the first empire, and proved a more formidable enemy to the Romans than any other Persian king. He punished the Arabs for their incursions, and took the King of Yemen prisoner, and as the successor of the ancient kings of Persia demanded from the Emperor of Constantinople the cession of all the country to the Strymon. Constantine the Great, Constantius II., and Julian resisted his demands; but Jovian purchased peace by the cession of Mesopotamia and Armenia, together with the five Roman provinces to the east of the Tigris. Sapor also extended his conquests into Tartary and India. War and peace successively followed without any important events after the death of Sapor. Under Ardishír (Artaxerxes II., 381–385), Shapúr (Sapor III., 385–390), Bahram (Varanes IV., 390–404), and Yezdigerd (surnamed Ulathim, or the Sinner, 404–420), the empire flourished. In the year 420 Bahram (surnamed Gour, the Wild Ass, on account of his addiction to the chase of that animal) ascended the throne. He was at first a violent persecutor of the Christians, but having been worsted in a war which broke out with the Byzantine emperor on that account he concluded a peace for 100 years, and bound himself no more to molest that part of his subjects. In his reign Armenia was divided between the Romans and Persians, the part which fell to the latter being called Persarmenia. After the conclusion of peace with the Eastern Empire he waged war with Huns, Turks, and Indians, and in these wars is said to have performed the exploits which have made him so celebrated a hero in Persian story. The next four kings were Yezdigerd II. (448–458), Hormúz (Hormisdas III., 458), Firoes (Peroses, 484), and Palash (Pallas, Valens, or Vologeses; 484–488). During their reigns the power of Persia declined, but it rose again under the next king, Kobad (Cobades, 488–498, then dethroned by Jamaspes or Zames, but restored in 502, and continued to reign till 531). He renewed the war with the Eastern Empire; but in 505, being embarrassed by the attacks of the Huns on the north, concluded peace with that power, surrendering Mesopotamia and his other conquests. As a protection against the Huns he seized and fortified the famous defiles of the Caucasus known as the Iberian and Albanian Gates, the latter now called Demir Kapu, (the Iron Gates), or the Gates of Derbend. His youngest son and successor, Khosru (Chosroes I.), surnamed Nushírwán, that is, the Generous Mind (531–579), was distinguished for his uncommon wisdom and valour. Under him the Persian Empire was extended from the Mediterranean to the Indus, from the Jaxartes to Arabia and the confines of Egypt. He waged successful wars with the Indians and Turks, with Justinian, Justin II., and Tiberius

II., and the Arabs, whom he delivered from the oppression of petty tyrants, and suppressed the rebellions of his brother and his son. At the time of his death he was engaged in a fresh war with the Eastern Empire. War continued under Hormúz (Hormisdas IV., 579–590) and Bahram (Varanes VI., 590–591). The latter king was a usurper, and was dethroned by Khosru (Chosroes II., 591–628), the eldest son of Hormúz, with the aid of the Emperor Mauricius. Under him the Persian power reached its highest pitch. Out of gratitude to Mauricius he maintained peace with the Eastern Empire as long as that emperor lived, but after his assassination took up arms to avenge his death. By successful wars he extended his conquests, on the one side to Chalcedon (616); on the other over Egypt to Lybia and Æthiopia, and finally to Yemen in Arabia. But the fortune of war was suddenly changed in the middle of the reign of the Emperor Heraclius. Khosru lost all his conquests, and his own son Siroes made him prisoner and put him to death. The decline of Persia was hastened by continued domestic feuds. Siroes or Shirweh was murdered in the same year. His son Ardishír (Artaxerxes) III., but seven years old, succeeded him, but was murdered a few days after his accession. He was the last descendant of the Sassanidæ in the male line. Numerous revolutions now followed, and with such rapidity that the historians have confounded the names of the principal actors in them. Yezdigerd III., a nephew of Khosru, ascended the throne in 632 at the age of sixteen. He was attacked by Caliph Omar in 636, and Persia became a prey to the Arabs and Turks. Yezdigerd lost his life in 651.

With the conquest of Persia by the caliphs begins the history of the modern Persian Empire. For more than 150 years after the Arab conquest Persia formed a province of the Mohammedan Empire; but about the beginning of the ninth century the Persian territories began to be broken up into numerous petty states, as some of the Arab governors made themselves independent, and Persian and Turkish princes possessed themselves of single provinces. Among the principal dynasties were—1. The Turkish house of the Taherites in Khorasan, from 820 to 872. 2. The Persian dynasty of the Sofarides, which dethroned the one last named, and ruled over Khorasan and Farsistan until 902. 3. The Samanide dynasty, which established its independence of Khorasan in 874 under Ahmed, in the province Mavaralnar, and lasted to 999. Ishmael, Ahmed's son, dethroned the Sofarides and became powerful. 4. The Ghaznavides, who trace their origin to Sebektegin, a Turkish slave and governor of the Samanides at Ghazna, where he made himself independent in 977. His son Mahmud subdued in 999 Khorasan, and drove the Samanides to Bokhara, where they were soon after overthrown by the Turkomans. In the following years Mahmud made great conquests in India, where he took Somnáth, on the coast of Gujerat, and even crossed the Ganges. In the last years of his life he turned his arms against the Buyides in the west of Persia, and deprived them of large portions of their territory; but his son Masud lost not only these conquests in the west, but also Khorasan; and in 1183 the dynasty, weakened by the attacks of the Seljuks and by internal dissensions, fell before the Ghurides. 5. The Ghurides, or sultans of Ghur, that is, of the mountainous region between Herat and Ghazna, became powerful in 1150 by means of Aladdin Hosain, but lost their ascendency in the beginning of the thirteenth century, partly by the encroachments of the princes of Khovaresm, and partly in consequence of domestic quarrels. 6. The dynasty of the Khovaresmian or Kharismian shahs (from 1097 to 1230) was founded by Atsiz, a Seljuk governor in Khovaresm, where he rendered himself independent. About 1194 Taksh or Takash destroyed the empire of the Seljuks, and took Khorasan from the Ghurides. His son Mohammed conquered Mavaralnar, subdued the Ghurides and Ghazna, and occupied the greater part of Persia. But in 1220 the great Mongol Genghis Khan deprived him of his dominions. His son, the heroic Gelaleddin Mankherni, made the most strenuous efforts to maintain himself against the invader, but after a struggle of ten years was completely vanquished and compelled to flee, and died in 1231 in a lonely hut in the mountains of Kurdistan. 7. The Buyides or Deilemites, descendants of Buyeh, a petty chieftain, who derived his origin from the Sassanidæ, by their valour and prudence extended their sway over the greater part of Persia, and in 945 even over Bagdad. They were chiefly distinguished for their virtues and love of science, and maintained themselves until about 1056, when they were obliged to yield to the Seljuks. 8. The Seljuks, a Turkish dynasty, first became powerful in Khorasan by the overthrow of the Ghaznavides. Togrulbeg Mohammed, a brave and prudent warrior, drove out the son of Mahmud, the Ghaznavide sultan, in 1037; extended his dominion over Mavaralnar, Azerbijan, Armenia, Farsistan, Irak Ajemi, and Irak Arabi, where he put an end to the rule of the Buyides at Bagdad, as already stated, about 1056, and was invested with their dignity as Emir al Omrah by the caliphs. Some of his descendants were distinguished for great activity and humanity. The most powerful of them, Malek Shah, conquered also Georgia, Syria, and Natolia, or Asia Minor. But the empire gradually declined, and was divided into four kingdoms, which were destroyed at different periods in the twelfth century by the shahs of Khovaresm, the atabeks of Aleppo, and the Mongols.

Through Genghis Khan the Tartars and Mongols became dominant in Persia about 1220, and they preserved this ascendancy till the beginning of the fifteenth century. Those Persian provinces which had been acquired by Genghis Khan fell in 1229 to his younger son Tuli, and then to the son of the latter, Hulaku, at first as governors of the Mongolian khans, Kajuk and Mangu. Hulaku extended his dominion over Syria, Natolia, and Irak Arabi. He or his successor became independent of the great khan, and formed a separate Mongolian dynasty in those countries, which sat on the throne till the death of Abusaid, without heirs, in 1335. His successors, also descendants of Genghis Khan, had merely the title of khans of Persia; but their kingdom was weak and divided. Then appeared (1387) Timurlenk (Tamerlane) at the head of a new horde of Mongols, who conquered Persia and filled the world from Hindustan to the extremities of Asia Minor with terror. But the death of this famous conqueror in 1405 was followed not long after by the downfall of the Mongol dominion in Persia, where the Turkomans thenceforward remained masters for 100 years. The Turkomans of the Black Sheep under Kara Yussuf were the first to make way in Persia, the greater part of which they wrested from the Timurides; but about 1468 these were themselves subdued by the Turkomans of the White Sheep under Uzem Hassan, and became incorporated with their conquerors. The Turkomans were succeeded by the Sufi dynasty about the beginning of the sixteenth century, and this dynasty lasted till 1736. The first sovereign of this dynasty, Ismail Sufi, who pretended to be descended from Ali, the son-in-law of Mohammed, took from the Turkomans of the White Sheep Azerbijan (1505–8) and part of Armenia, slew both

their princes, and founded upon the ruins of their empire, after having conquered Shirvan, Diarbekir, Georgia, Turkestan, and Mavaralnar, another which comprised Azerbijan, Diarbekir, Irak, Farsistan, and Kerman. He assumed the name of a shah, and introduced the sect of Ali (the Shiite sect) into the conquered countries. His successors Tamasp (1523–75), Ismael II. (1576–77), Mohammed (1577–1586), Hamzeh (1586), Ismael III. (1587), carried on unsuccessful wars against the Turks and the Usbeks. But the great Shah Abbas (1587–1628) re-established the empire by his conquests. He took from the Turks Armenia, Irak Arabi, Mesopotamia, the cities of Tauris or Tabreez, Bagdad, and Bassora; Khorasan from the Usbeks, Ormuz from the Portuguese, and Kandahar from the Mongols; and humbled Georgia, which had refused to pay tribute. He introduced absolute power into Persia, transferred his residence to Ispahan, and instituted the pilgrimage to Meshed in order to abolish that to Mecca among the Persians. In 1626 he concluded a commercial treaty with England through the English ambassador, Sir D. Cotton. The following rulers, Sam Mirza (Shah Sofi I., 1628–41) and Abbas II. (1641–66), had new wars with the Turks and Mongols—with the former on account of Bagdad, which was permanently lost; and with the latter on account of Kandahar, which was lost in 1639, but recovered in 1648, or according to some in 1660. Under Shah Soliman (Sofi II., 1666–94), however, the empire declined, and entirely sunk under his son Hussein. The Afghans in Kandahar revolted in 1709 under Mirweis, and his son Mir Mahmud conquered the whole empire in 1722. A state of anarchy followed. Mahmud, having become insane, was dethroned by Ashraf in 1725; but the latter was himself subdued by Nadir Kuli Khan, who, with the assistance of the Russians and Turks, placed Tamasp, son of Hussein, on the throne in 1729 or 1730. But when the latter ceded Georgia and Armenia to the Turks, Kuli Khan dethroned him, and placed his minor son Abbas III. on the throne (1732). Kuli Khan then recovered, by conquest or treaties, the provinces ceded to the Russians and Turks; and Abbas III., having died in 1736, ascended the throne himself with the title of Nadir Shah. He restored Persia to her former importance by successful wars and a strong government. He even extended his conquests to India, where he obliged the great Mogul Mohammed to cede to him some provinces on the Indus and most of his treasures. But in 1747 Nadir was murdered by the commanders of his guards, and his death threw the empire again into confusion. Four kingdoms were now formed: 1, Khorasan and Sagistan; 2, Kandahar or the eastern provinces; 3, Farsistan or the western provinces; and 4, Georgia. The last for the most part retained its own princes, who at length submitted to Russia. In Kandahar and East Iran Ahmed Abdallah founded the Empire of Afghanistan. In the two other kingdoms Kerim Khan, who had served under Nadir, and was according to one account a Kurd of low extraction, but according to another a Persian chieftain of noble birth, succeeded, after a long period of anarchy, in establishing tranquillity and making himself master of the whole of Western Iran or modern Persia. His wisdom, justice, and warlike skill gained him the love of his subjects and the esteem of his neighbours. He did not call himself *khan*, but *vekil* (regent). He fixed his residence at Shiraz in 1755, and died in 1779. New disturbances arose after his death. His brothers attempted to get possession of the throne, to the exclusion of his sons. A prince of the blood, Ali Murat, occupied it in 1781; but a eunuch, Aga Mohammed, a Turkoman belonging to the noblest family of the tribe of the Kajars, and a man of uncommon qualities, had made himself independent in Mazanderan. Ali Murat, who marched against him, died in consequence of a fall from his horse, and left the sceptre to his son Jafar, who was defeated by Aga Mohammed at Jezd Kast, and fled to Shiraz, where he perished in an insurrection. His son Lutf Ali made several desperate efforts to recover his throne; but Aga Mohammed was victorious, and appointed his nephew Baba Khan his successor, who began to reign in 1796 under the name of Futteh Ali Shah. He fixed his residence at Teheran in order to be nearer the Russians, who threatened his northern provinces. This monarch's reign was in great part taken up with wars with Russia and Turkey. His first war with Russia was concluded by the Peace of Gulistan in 1813, in which he was obliged to cede to Russia all his possessions to the north of Armenia. Then followed a war with Turkey (1821–23), in which he was no more successful. And finally a second war with Russia broke out, at the conclusion of which in 1828 he was compelled to surrender his share of Armenia. Futteh Ali died in 1834, leaving the crown to his grandson Mohammed Shah, during whose reign Persia became constantly weaker, and Russian influence in the country constantly greater. He died in 1848, and was succeeded by his son Nassr-ed-Din. This king began his reign by the promise of many reforms in the administration, but soon fell into the same indolence, and exhibited the same amount of misgovernment as his predecessor. The result was that numerous insurrections broke out in the different provinces of the empire. Of all the provinces the most unsettled was Khorasan, the inhabitants of which, belonging to the pure Persian party, refused obedience to the Kajar dynasty on religious grounds. In 1851 a serious rebellion burst forth here, and although it was soon quelled the army employed in this duty was still kept in action. The Sultan of Herat having died, and a contest for the throne having arisen between Dost Mohammed, the khan of Kandahar, and his half-brother for the throne, Nassr-ed-Din took advantage of this to advance into Afghanistan and seize Herat. In this he was temporarily successful; and in May, 1852, the Sultanate of Herat was annexed to Persia, which, however, was compelled by the English to relinquish its conquest. In 1855 the Persians again occupied Herat, and hostilities were resumed by England. In the following year an English army landed at Bushire, on the Persian Gulf, and having captured that town, began the march to Teheran, and was only stopped by the prompt conclusion of peace (the Peace of Paris), March 3, 1857. In recent years Persia has made some important acquisitions of territory. Since the death of Said Tsuéni, sultan of Oman, in 1867, it has come into the possession of the strip of coast on the north-eastern shore of the Persian Gulf, and the Islands of Ormus, Larek, and Kishm, which previously formed parts of the Sultanate of Oman. In the East it has incorporated a portion of Seistan and Kohistan, formerly belonging to Afghanistan and Beluchistan. These territories had long been in dispute between the different powers mentioned, and in 1868 were occupied by Persia, to which they were finally awarded in 1872, when the settlement of the dispute had been put in the hands of an English commissioner. The western portion of Mekran, on the south coast, formerly belonging to Beluchistan, has also been incorporated. On the north-east the boundary between Persia and the Russian territory beyond the Caspian, after remaining long uncertain, was settled in the end of 1881, the lower course of the river Atrek, and farther east certain mountain ridges north of that river, forming the new boundary line.

At one time Persia claimed the oasis and town of Merv, lying between the Atrek basin and the territories of Khiva, and inhabited by the Tekke Turcomans. In 1876 an expedition was organized for the purpose of making good those claims, but after a single defeat was given up. The people of Merv have recently placed themselves under Russia's protection.

Persian Language and Literature (ancient and modern).—Iranian is the name now given by preference to all forms of the Persian language, which belongs to the great Indo-European or Aryan division of languages. The oldest form of the language is that which is now called the Old Bactrian, from the province of Bactria, in which it originated, but which was formerly improperly called Zend. It is that in which the Zendavesta was originally composed, and is very closely allied to the Old Sanskrit of the Vedas. It is divided into two dialects—that of the Gâthâs or songs, which form the oldest part of the Zendavesta; and the classical Zend, which died out in the third century B.C. The next development of the Iranian language is the Old Persian of the cuneiform inscriptions of the Achæmenian dynasty, found at Behistun, Nakhshi-Rustum, Persepolis, and Elvend. We then lose sight of the Iranian language, and in the inscriptions and coins of the Sassanian kings, and in the translations of the Zendavesta made during the period of their sway in Persia, we find a language called Pehlevi, or Pehlvi, and sometimes though wrongly Huzvaresh. Of this language Max Müller (see the first vol. of his Lectures on the Science of Language, ch. v.), quoting the opinions of Haug, the chief authority on the subject at the present day, gives the following account:—'This language, though mixed with Iranian words, is decidedly Semitic, and is now supposed to be the continuation of an Aramæan dialect spoken in the ancient empire of Assyria, though not the dialect of the Assyrian inscriptions. Formerly Pehlevi was considered as a dialect that had arisen on the frontiers of Irán and Chaldæa, in the first and second centuries of our era—a dialect Iranian in grammatical structure, though considerably mixed with Semitic vocables. Later researches, however, have shown that this is not the case, and that the language of the Sassanian coins and inscriptions is purely Aramaic. How this Aramaic dialect became prevalent in Persia, not only under the Sassanian, but under the Arsacidan and earlier dynasties, has not yet been fully explained. But the most curious point is that the Pehlevi translation of the Avesta, which was the authorized translation at the time of the Sassanian kings, but may have existed long before their time, was read by the priests by substituting Iranian for the Aramaic words, a mode of reading which is observed to the present day, and which was properly called *Huzvaresh*. This mode of reading Pehlevi, by substituting Iranian for Aramaic words, can alone explain the fact, that in the MSS. of the Pehlevi texts, Iranian terminations are added to the Pehlevi words, thus giving to the Pehlevi the false appearance of an Aryan language.' The Pehlevi was replaced by the Parsi, a pure Persian dialect which was spoken in Persia proper, answering to the modern Farsistan. Under the name of Zeban Deri it was the sole language permitted to be spoken at the court of Ispahan, and it is still spoken by all those who pride themselves on having had a good education. The language spoken by the people is largely mingled with Arab words and phrases, introduced with Mohammedanism after the Arab conquest. It is distinguished from the Zeban Deri by the name of Valaat. The Persian language is soft, rich, and expressive. In the simplicity of its grammatical construction it resembles the English; in its power of compounding words, the German. In modern times numerous dialects of Persian have been formed, such as the Kurd, spoken on the western frontier of the country; the Mazanderain in the province from which it takes its name; &c.

The written character of the Persian language is the Arabic, with the addition of four letters with three points, which are not in the Arabic. The Persian literature, of which the Magi were in possession until the introduction of Mohammedanism, has nothing to show in its old dialects, the Old Persian and Pehlevi, but the works above mentioned, besides a few theological and historical writings, some of which were brought to Europe by Ouseley. What escaped destruction in the time of Alexander was destroyed under the caliphs, and a few fragments only were preserved among the fugitive Parsees or Guebers. Persian civilization declined during the first period of the Arabian dominion; even in the tenth century no traces of any literature are to be found among the Persians. Learning first revived in Persia in the time of the Abassides, and Arabian literature was already on the decline, when the Persian, favoured by the Buyides and Seljuks, revived. The flourishing period of literature continued till the time of Genghis Khan, in the thirteenth century. Under Timur in the fourteenth century, and the Turks in the fifteenth, it continually declined, and in the sixteenth was almost entirely extinct. The oppressions and disturbances to which Persia has since been continually subject, have prevented the revival of learning. But the Persians possess rich literary treasures of the earlier periods, particularly in poetry, history, geography, &c. We must limit ourselves chiefly to a notice of that portion which has been touched by Europeans.

The most brilliant part of Persian literature is poetry. (See Von Hammer-Purgstal's History of Persian Polite Literature, in German; Vienna, 1818.) Among the poets are the following: Rudegi (flourished about 952), the father of modern Persian poetry, who translated in verse the collection of Indian tales called Bidpay's fables; the epic poet Firdusi, author of the Shahnameh, or Book of Kings, who lived under the Ghaznavides at the beginning of the eleventh century (see FIRDUSI); and his contemporaries, the celebrated lyric poets Ansari and Ahmed Essedi of Thus. Also distinguished as lyric poets are Anweri or Enweri, of Bednah, in Khorasan (died 1200); Chakani, his contemporary and rival; Hafiz (born about the beginning of the fourteenth century), the most celebrated writer of odes (see HAFIZ); Jami (see JAMI), one of the most productive and most captivating of Persian poets; Hatefi, Emir Khosru, Senai, Shefali, and many other writers of the divan, who are mentioned in Von Hammer's work above referred to. To the lyric poets of Persia also belong the Turkish Emperor Selim I., the unfortunate Shah Allum (see Franklin's Life of Shah Allum), and the Shah Futteh Ali. As a lyric mystic and moral poet Sheik Sadi is the most celebrated, not only in the East, but also among us. Ferideddin Attar, a contemporary of Sadi's, was the author of a very valuable collection of proverbs, under the title of Pendnameh (Book of Counsel), of which Sylvestre de Sacy has published a complete edition; of the Mantiket-ettaïr, or Colloquy of Birds, in which he dwells on the theosophic contemplation of Deity (published in Persian and French by Garcin de Tassy; Paris, 1857); and of several other poetical works. Jelaleddin Rumi of Balk, in Khorasan, is esteemed the most perfect model of the mystic school; he formed a sect, and died 1262 a pious Sufi. His great work, Kilat el Metnavi (Collection of Distichs), is so difficult to be understood that a glossary is necessary. Nisami (which see), who lived at the end of the twelfth century, was

the founder of the romantic epic, and author of a Chamsse, that is, a collection of five considerable romantic poems. Feisi, who lived about 1540 at the court of the Great Mogul Akbar, is the author of an epic embodying the old Indian tale of Nala and Damayanti (Calcutta, 1831). The most recent of the larger poems in Persian are the Shehinshah-nameh, which records in verse the recent history of the country; and the George-nameh, by Firos-ben-Kaus (Bombay, 1839), celebrating the conquest of India by the English. A collection representing the popular literature of Persia, and containing songs, ballads, and cycles of historical poems, has been published by A. Chodzko under the title Specimens of the Popular Poetry of Persia (London, 1842). The Persians are remarkable as being the only Mohammedan nation which has cultivated the drama. Their productions in this province of literature closely resemble the mysteries of the middle ages, and abound in natural and affecting lyrical passages. Compare Chodzko Sur la littérature dramatique des Persans (Paris, 1844), and Specimens of the Persian Drama, published in the original at Paris in 1852. Sources of information concerning the Persian poets are the Beharistan of Jami; the works of Haji Chalfa; the lives by the Persian Dauletshah, continued by Sam Mirza under the title Teskiretesshoara (of which some extracts may be found in the Notices et Extraits des Manuscrits, &c., by Sylvestre de Sacy), and the Ateshkede (Fire Temple), by Haji Lotfali Beg, surnamed Azir.

Not less numerous are the prose fables, tales, and narratives. Among these are the Anwar Soheili, a charming prose translation of the fables of Bidpay; the Bahar Danush of Majet Allah (translated by Jonathan Scott, 1799, three vols.); the Tootinameh, or Tales of a Parrot (Persian and English, by Hadley); the Tales of Bakhtyar and the Ten Viziers, &c., translated by Ouseley (London, 1801). Other similar works have been given us by Scott in his Tales, Anecdotes, and Letters, translated from the Arabic and Persian (1800); by Langles in his Contes, Sentences et Fables, tirées d'Auteurs Arabes et Persans (1788), and in other collections of this kind. It was also through the Persian that the great wealth of Indian literature in fables and tales was transmitted to the Arabs, and thence to Europe. (See ARABIAN NIGHTS.) In the departments of history, geography, and statistics the Persians have some large and valuable works. Abu Said, or Abdallah Ben Abulkasin Beidavi, wrote a universal history from Adam to his own time (1276), under the title of Historical Pearl Necklace. Andrew Müller has published in Persian and Latin the eighth part of this work, which contains the history of China. Turan Shah, who died at Ormuz, 1377, wrote a Shahnameh, of which an abstract is given in Pedro Texeira's Relaciones del Origen Descendancia y Succesion de los Reyes de Persia y de Hormuz (Antwerp, 1610). Mirkhond, who flourished in 1471, wrote a voluminous historical work, entitled Garden of Purity in the History of the Prophets, Kings, and Caliphs, of which, besides the fragment in Wilkins' Persian Grammar, four extracts have been published—in the History of the Persian Kings, by Jenisch (Vienna, Persian and Latin); the History of the Sassanides, in French only, by De Sacy, in his Mémoires sur diverses Antiquités de la Perse; the History of the Samanidæ, by Wilken (Persian and Latin, Göttingen, 4to); and the History of the Dynasty of the Ishmaelites, by Jourdain in his Notice de l'Histoire universelle de Mirkond, &c. (Paris, 1814, Persian and French). A complete edition of Mirkhond's work was published at Bombay in two vols. in 1849. The Tarik el Tabari (a History of Nations and Kings) was originally written in Arabic by Mohammed Ebn Giaffir Mahomed Ben Gerir, but is now extant only in a Turkish translation and in the Persian translation of Balami (French by Dubeux; London, 1835). The Lebtarik (Marrow of History) of Kazwini (fourteenth century) has been translated into Latin by Gaulmin and Galland. Ferishta (which see) was the author of a History of Hindustan, and another of Dekkan. A valuable work on the Mogul Empire in the time of Akbar is the Akbarnameh of the Vizier Abul Fazl (put to death 1604), the most elegant writer of Hindustan, written by command of Akbar himself. The two first parts of this work contain a history of Akbar and his predecessors; the third, entitled Ayeen Akbari, contains a geographical, statistical, and historical description of Hindustan, with much other information. Of this third part Gladwin has published extracts under the title Ayeen Akbery, or Institutes of the Emperor Akbar. There are numerous works comprising short periods of time, as single dynasties and single reigns. The Tarik Ali Mosaffer contains a history of the seven kings of the Mosaffer family. Shah Babur left valuable commentaries concerning Hindustan, translated into Persian by Abdul Rahim (English by Dr. Leyden and Mr. Erskine). Abul Rizak wrote a Life of the Shah Rokh and his successors, and the History of his Embassy to China and Hindustan, the latter of which has been translated by Langles in his Collection portative des Voyages. The Chronicle of Wassaf (about 1333) contains the history of the successors of Genghis Khan, and is written in an extremely finished style (Persian and German by Von Hammer, Vienna, 1856; Persian text alone, Bombay, 1853). Sherifoddin, or Molla Sherifoddin Ali Yezdi (fifteenth century) wrote a Biography of Timur, full of fables, translated into French by Petit de la Croix (Paris, 1724). Here we may mention the Tuzukati Timur, translated by Davy and edited by White, under the title Institutes Political and Military, written originally in the Mogul language by the great Timur, translated into Persian by Abu Talib Alhusseini, and thence into English (Oxford, 1783, 4to). Sir W. Jones translated into French a History of Nadir Shah by Mirza Mohammed Mahadi Khan of Mazanderan. A History of the Afghans by Neamet-ullah was translated into English by Dorn, and published in London in 1829. A History of India from 1705 to 1782, bearing the title Siyar Mutakherin, by Gholam-Husain-Khan, was published in an English translation at Calcutta in 1789, and in the original in 1832. One of the most recent of Persian historical works is the Measiri sultanijje, giving the history of the reigning dynasty (Teheran, 1825; English by Brydges, London, 1833).

As to the geographical works in the Persian language, Ouseley has published a fragment of the Cleimat (the Seven Climates) in his Oriental Collections, and an abstract of the Persian translation of the geography, written in Arabic by Ibn Haukal. In ethics may be mentioned the Kabusnameh, composed by a Deilemite prince about 1080 (German by Diez; Berlin, 1811); and Achlaki Jelali (Calcutta, 1811; English by Thompson, London, 1839); and in rhetoric, Hadaik-ul-belaghet (the Bowers of Eloquence), by Shemseddin (Calcutta, 1814); and Nahr-ul-fasahet (the Stream of Eloquence), by Mirzakatil (Calcutta, 1820). Geometry and astronomy were also cultivated with ardour by the Persians. Nasereddin of Thus translated and Maimon Raschid commented upon Euclid. Omar Chehan (in 1072), in the reign of Malek Shah, calculated the solar year at 365 days 5 hours 48 minutes and 48 seconds; and among the astronomical tables computed by Persians the most valuable are those prepared by Nasereddin

at the command of Hulaku Ilekan, and called by his name, but not completed till five years after Ilekan's death (1269), and those drawn up in the first half of the fifteenth century, under the superintendence of Ulug Beigh, by a large number of astronomers, and which were published by Greaves and Hyde. A Persian calendar, under the title Ruznameh nauruz, has likewise been printed. The works upon Mohammed, the Mohammedan religion, the legends of the saints, &c., are numerous, but for us of little interest. The Persian abridgment of the Vedas, entitled Oupnek'hat, although almost unintelligible by us (translated into Latin by Anquetil du Perron, 1804, two vols. 4to), and the Desatir (which see), are important monuments. The Pentateuch of Moses in the Persian language, translated by a Jew of Thus, is in Walton's Polyglot. Of the Gospels there are two translations, one in the Polyglot above named, and the other published by Wheelock (London, 1657, folio). Among the more important of the other religious works in Persian are Ulemaï Islam, which gives information relating to the Old Persian religion (Persian by Olshausen, Paris, 1829; German by Vullers, Bonn, 1832); and the Dabistan, containing an account of all the religions of Asia (Calcutta, 1809; English by Troyer, London, 1843). The Persians have also translated many works belonging to old Indian literature, among others the epics Ramayana and Mahabharata, besides the abridgment of the Vedas already mentioned.

The Persians have paid great attention to their own language; of this the number of lexicographical and grammatical works extant affords abundant proof. The small Persian-Turkish dictionary of Shahidi is only for beginners. That of Ardeshir is more celebrated; and also the Naëmet Allah (Delight of God), adopted by Castellus as the basis of his; but the best are the Burhani-kati (Calcutta, 1818), Ferhengi Schuuri (Constantinople, 1742), and Heftkulzum (Lucknow, seven vols. 1822). This view is sufficient to show the importance of the Persian language, since, besides being in the East, especially in India, what the French is in Europe, it possesses valuable treasures, not only of native literature, but also of translations from the Arabic, different Indian, and other languages, the originals of some of which are lost, and of others are inaccessible to us. We are also copiously supplied with aids in this study. The grammars of Jones and Richardson (not to mention earlier ones) are now surpassed by Gladwin's Persian Moonshee, and still more by Lumsden's Persian Grammar (Calcutta, 1810). In Germany Vullers has published the best Persian grammar (Giessen, 1840). Of the composite dictionaries the most complete are Meninski's Lexicon Arabico-Persico-Turcicum (second edition, Vienna, four vols. fol. 1780–1802). Richardson's Dictionary, Persian, Arabic, and English, &c., a new edition, with additions and improvements by Johnson (London, 1852); Barretto's Persian and Arabic Dictionary (two vols.); Hopkin's Abridgment of Richardson (in one vol. 1810); and Vuller's Lexicon Persico-Latinum (Bonn, two vols. 1853–59) are the best. Much valuable information is contained in Jones's Commentaries; Ouseley's Oriental Collections and Persian Miscellanies; Gladwin's Dissertations on the Rhetoric, Prosody, and Rhyme of the Persians, in the Fundgruben des Orients (Mines of the East); in the valuable works of J. von Hammer, and other authors who have treated on oriental literature. The most complete list of the Persian works that have been published in Europe and the East is to be found in Zenker's Bibliotheca Orientalis (Leipzig, two vols. 1846–59).

PERSIAN ERA. See EPOCH.

PERSIAN GULF, a sea or gulf separating Persia from Arabia, and communicating with the Indian Ocean by the Strait of Ormuz, 35 miles wide; its greatest length is 560 miles; medium breadth, 180 miles. The principal river which runs into it is the Euphrates, and it receives likewise numerous small streams from the mountains on the Persian side. The only important harbour is Bushire, on the Persian coast. There are many islands in the gulf, the largest of which are those of Kishim and Ormuz, near the strait of that name, and the Bahrein Isles, on the coast of Arabia. The west coast, especially in the neighbourhood of the Bahrein Islands, is celebrated for its pearl fisheries, and there is good anchorage on the east.

PERSIAN POWDER, a powder made from the flowers of the *Pyrethrum carneum* or *roseum*, a plant belonging to the natural order Compositæ, and a native of the Caucasus Mountains. It is largely used in Russia, Turkey, and Persia for destroying noxious insects, and has latterly been introduced also into the countries of Western Europe for the same purpose, for which it is very efficacious.

PERSIAN WHEEL, or NORIA, an apparatus of simple construction used for raising water. It is merely a water-wheel with float-boards, which is placed in a stream, and set in motion by the water acting on the float-boards; a number of buckets, movable about an axis above their centre of gravity, being suspended to the rim. As the wheel goes round the buckets enter the water in succession, and are carried up full. When they reach the highest point they strike against a fixed obstacle, so as to tilt over and empty their contents into a spout or reservoir placed to receive them. Of course the water can be raised by this contrivance only to the height of the diameter of the wheel. This wheel is common not only in Persia, but also in Egypt, on the banks of the Nile, in Spain, and elsewhere. It is generally used in connection with a system of irrigation.

PERSIGNY, JEAN GILBERT VICTOR FIALIN, DUC DE, a French statesman of the second empire, born in January, 1808, at St. Germain Lespinasse, in the department of Loire; died at Nice, in January, 1872. In his youth he was a royalist; but, having entered the army, he had his views changed, and was converted into a republican through the influence of one of his superior officers. While holding these sentiments he took part in a movement among a section of the troops in favour of the revolution of July (1830), in such a manner as to lay himself open to the charge of insubordination, on which account he was dismissed the service. He then came to Paris without means, and without a profession. Here his views suffered another change. Through reading the Mémorial de Ste.-Hélène he was gained over to the Bonapartist cause, and the efforts which he made in furtherance of his new political creed recommended him to the favour of Louis Napoleon (afterwards Napoleon III.), who was then living at Arenenberg, in Switzerland, and who attached him to his person. He was henceforth the most active and zealous of Louis Napoleon's supporters. He was the instigator of the military rising at Strasburg in 1836, and himself took part in it. He was arrested, but managed to escape; and in 1840 shared in the expedition to Boulogne, when he was again captured; and on this occasion he was condemned by the Court of Peers to twenty years' confinement. He was at first imprisoned in the fortress of Doullens; but as his health was found to be suffering, his captivity was afterwards made much milder, and ultimately was nothing more than restriction to the town of Versailles. On the outbreak of the revolution of February, 1848, he hastened to Paris, and began to do all in his power to turn the occasion to the advantage of Louis Napoleon. He brought about an agreement between the

members of the Napoleon family, collected their adherents, got several journals started in their interest, travelled over France on their behalf, and in various other ways largely contributed to determine the vote by which Louis Napoleon was elected president of the republic, on the 10th of December, 1849. He was also one of the most prominent actors in the *coup d'état* of December 2, 1851. In January, 1852, he was nominated minister of the interior, and in this capacity signed the decrees relative to the confiscation of the Orleans estates, and directing the first elections to the *corps législatif*. In the same year he married the only daughter of the Prince of the Moskwa, on which occasion he was made a count. On the 31st of December, in the same year, he was appointed a member of the senate. In 1854 he resigned his post of minister, and in the following year went as ambassador to London. In 1860 he again filled his former office; but in 1863, when the elections in Paris turned out in favour of all the opposition candidates, resigned his portfolio once more. From that time to the end of his life he never again took office, although he still remained a devoted adherent of the Bonapartists. He was elevated to the rank of duke in 1863.

PERSISTENCE OF VISUAL IMPRESSION. The eye is capable of receiving the image of an object which is only luminous for an instant, but the impression on the retina disappears only after a certain time has elapsed, generally one-third of a second. Hence a luminous point in motion appears as a luminous line. If two pictures are presented to the eye in successive instants, they become superimposed, owing to this persistence. The thaumatrope, phenakistoscope, and zoetrope are toys based on this phenomenon.

PERSIUS, full name AULUS PERSIUS FLACCUS, a Roman satirical poet, was born A.D. 34, at Volterra in Etruria, and died in 62. According to some Luna was his birth-place. His family was of the equestrian order, and he received his education at Rome. He was on friendly terms with some of the most eminent men of the time, and was much beloved on account of the purity and amenity of his manners. He died at the age of twenty-eight years. The Stoic Cornutus, one of his first teachers, published six satires by him, which present a picture of the prevailing corruption, in contrast with the standard of Stoic wisdom and the old Roman severity. They are distinguished for vigour, conciseness, and austerity of tone. Their obscurity arises in part from their allusions to subjects now unknown, and in part from their abrupt and concise style. The best editions are those of Casaubon (Paris, 1605), Orelli (Zürich, 1822), Jahn (Leipzig, 1843), and Heinrich (Leipzig, 1844). Dryden and Gifford, among others, have translated them into English. Madan's edition of Juvenal and Persius, with a prose translation and English notes (1789), deserves notice.

PERSONAL ACTIONS, are actions brought for the specific recovery of goods and chattels, or for the redress of breaches of contract or other injuries, in contradistinction to *real actions* brought for the recovery of lands, tenements, and other heritable property.

PERSONALITY, or PERSONAL PROPERTY, in the law of England, consists of leases, money, goods, and other movables, which are either transferable, or may easily become so. It comprehends everything which wants the two requisites of a real estate—duration and immobility.

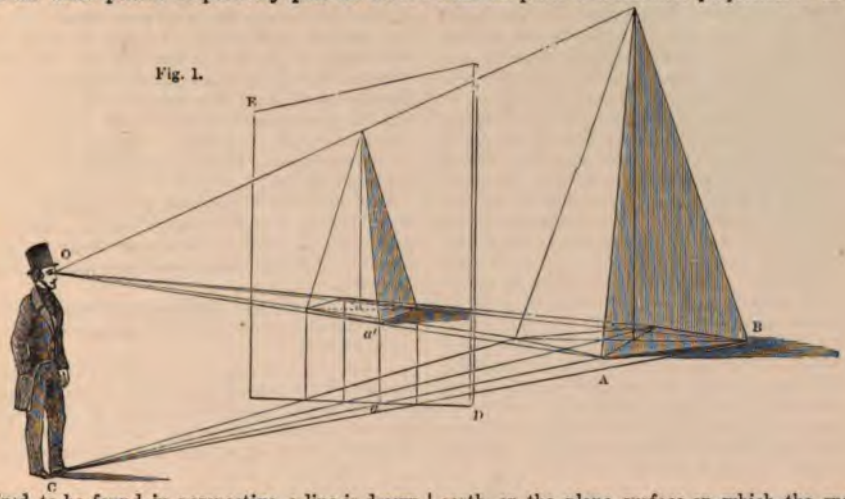
PERSONIFICATION, in the fine arts, poetry, and rhetoric, the representation of an inanimate subject as a person. This may be done in poetry and rhetoric either by giving epithets to inanimate subjects which properly belong only to persons, or by representing them as actually performing the part of animated beings. In the latter case the name *prosopopœia* is also used. Strictly speaking we may be said to personify whenever we apply an epithet expressive of life to an inanimate subject, as 'awakening nature,' 'raging storm;' but a little reflection will show us that ordinary language is full of personifications of this kind. The word personification is therefore generally applied only to a formal representation of a thing as a person. The more the imagination prevails among a people the more common are personifications. Take, for instance, the tales of the Arabs. As reflection acquires the ascendency personifications are less used. Many of the ancient myths are personifications of powers of nature or events of history.

PERSPECTIVE, the art of copying the appearance of objects, as seen from a certain point of view. It enables the artist to represent objects on a given surface, as if the surface were transparent, and the objects were seen through it. As we see by means of the rays of light which proceed in straight lines from the objects to our eyes, perspective rests on optical principles; and as the drawing of the form of an object is an arrangement of lines and angles according to geometrical principles, perspective may be considered as a branch of geometry. That part of perspective which relates to the form of the objects differs essentially from that which teaches the gradation of colours according to the relative distance of objects. Hence perspective is divided into *mathematical* or *linear perspective*, and the perspective of colour or *aerial perspective*. Both are of the greatest importance to painters, architects, sculptors, &c. Without a correct observance of the rules of perspective no picture can have truth and life. Perspective alone enables us to represent foreshortenings with accuracy, and it is requisite in delineating even the simplest positions of objects. As long, therefore, as its rules were unknown the act of drawing necessarily remained in its infancy. This art has been most cultivated in modern times, yet the paintings found in Herculaneum prove that the ancient Greek painters were acquainted with it in some measure.

The contour of an object drawn upon paper or canvas represents nothing more than such an intersection of the visual rays, sent from the extremities of it to the eye, as would arise on a glass put in the place of the paper or canvas. Now the situation of an object at the other side of a glass being given, the delineation of it on the glass itself depends entirely on the situation of the eye on this side of the glass; in other words, 'on the rules of perspective.' Suppose a spectator to be looking at a prospect without doors from within through a glass window; he will perceive the shape, size, and situation of every object visible upon the glass. If the objects are near the window the spaces they occupy on the glass will be larger than when they are at a greater distance; if they are parallel to the window, their shapes upon the glass will be parallel likewise; if they are oblique, their shapes will be oblique, and so on. As he alters the situation of his eye, the situation of the objects upon the window will be altered also; if he raises his eye, the objects will seem to rise higher upon the window, and the contrary if he lowers it. The horizon will in every situation of the eye be upon a level with it, that is, the imaginary line which parts the earth and sky will seem to be raised as far above the ground upon which the spectator stands as his eye is. Now suppose the person at the window keeping his head steady draws the figure of an object seen through it upon the glass with a pencil, as if the point of the pencil touched the object, he would then

have a true representation of the object in perspective as it appears to his eye. To every person who possesses a general knowledge of the principles of optics this must be self-evident, for as vision is occasioned by pencils of rays coming in straight lines to the eye from every point of the visible object, it is plain that by joining the points in the transparent plane through which all those pencils respectively pass an exact representation must be formed of the object as it appears to the eye in that particular position, and at that determined distance. The accompanying figure will make this clearer. Let us suppose any object, as the pyramid A B, to be viewed by a spectator at C, through a transparent plane D E. A horizontal projection of the visual rays is made, that is to say, from the plane or horizontal projection of the point

Fig. 1.



required to be found in perspective, a line is drawn to the position or station point of the spectator, as A a C, and another line from its vertical projection to the eye of the spectator, as A a' O. At the points of intersection of the first set of lines with the horizontal projection of the picture a perpendicular a a' is drawn, and the intersection of this with the corresponding line from the vertical projection gives the point a' required. All the other points are obtained in the same manner. Were pictures of things to be always first drawn on transparent planes, this simple operation, with the principle on which it is founded, would comprise the whole theory and practice of perspective. As this, however, is far from being the case, rules must be deduced from optics and geometry for drawing representations of visible objects on opaque planes, and the application of these rules constitutes what is properly called the art of perspective. There are used in perspective a certain number of terms peculiar to the art, definitions of which are necessary to an intelligent use of them. The *original object* is that which is made the subject of the picture. *Original planes* or *lines* are the surfaces or lines of original objects. The *point of view* is the situation of the eye. The *point of sight* is the point in the perspective plane which is nearest to the eye, being directly opposite to the point of view. All lines which in nature are perpendicular to the ground plane, or to a vertical plane which is raised upon it as a base, meet in the point of sight, which is thus their *vanishing point*. The point of sight is also called the *centre* of the picture. A *visual ray* is a line from the object to the eye. If the object is a point, there is but one visual ray; if it is a line, the visual rays form a triangle; if it is a square, they form a pyramid; if a circle, a cone, &c. The principal visual ray is that from the nearest point in the picture, or point of sight. The *perspective plane* is the surface on which the picture is delineated, or it is the transparent surface through which we suppose objects to be viewed. The *directing plane* is a plane supposed to pass through the eye of the spectator, parallel to the perspective plane. The *ground plane* is the earth, or the plane surface on which the spectator and objects are situated. The *horizon* or *horizontal plane* is one parallel to the ground plane, and at the height of the spectator's eye. The *horizontal line* is the intersection of the picture or perspective plane with the horizontal plane. The *ground line* is the intersection of the perspective plane with the ground plane, or it is the line on which the picture is supposed to stand. The *perpendicular* is a line on the perspective plane drawn through the point of sight, perpendicular to the ground line and horizontal line. The *points of distance* are points on the perspective plane, set off from the point of sight, sometimes on the horizontal line and sometimes on the perpendicular, at the same distance from the point of sight that the eye is supposed to be at from the perspective plane.

Projections.—The projections of a body are the different modes by which it may be delineated on a plane surface. *Scenographic* projection represents objects as they actually appear to the eye at limited distances. *Orthographic* projection represents objects as they would appear to the eye at an infinite distance, the rays which proceed from them being parallel instead of converging. The shadow which a body casts in the rays of the sun may be considered as an orthographic projection. In this projection lines which are parallel in the original are parallel in the picture, and do not converge to any vanishing point. Their comparative length, also, is not affected by difference of apparent distance. Orthographic projection is much used in delineating buildings, machinery, &c., because those parts of the drawing which are not foreshortened maintain their true relative size, so that measures can be taken from them. The term *ichnographic* projection is sometimes used to express the horizontal delineation, or ground plan, of an object. A *bird's-eye view* is a scenographic or orthographic projection taken from an elevated point in the air from which the eye is supposed to look down upon the objects. Geometrical and mechanical methods will enable a person not previously conversant with the art to obtain correct perspective repre-

sentations of any object. But by long practice in drawing from nature a certain tact is acquired by painters, which enables them, by the accuracy of the eye and judgment alone, to make correct views of objects without the aid of any computation or mechanical process.

Equally important with linear perspective is *aerial perspective*, though not founded on equally demonstrable rules. It teaches how to judge of the degree of light which objects reflect in proportion to their distance, and of the gradation of their tints in proportion to the intervening air. The nearest objects only appear in their true colours and full light. In the case of the more distant the light and colour become blended with the colours of the vapours which fill the air, in proportion to their distance, until at last the objects become lost in an indistinct mass, of a bluish tinge, in the horizon, whilst their colour and that of the air become one. The proportion of this *degradation*, as it is called, is regulated by the purity of the air, being greater according as there is more vapour in the air. Hence distant objects in a clear southern air appear much nearer than they really are, to an eye accustomed to a thick northern atmosphere. As the air changes the aerial perspective must change. Morning, noon, evening, moonshine, winter, summer, the sea, &c., all have their different aerial perspective. In aerial perspective the weakening of the tints corresponds to the foreshortening of the receding lines in linear perspective. In the illuminated parts of objects the tints are represented more broken and fluctuating. The shaded parts are often aided by reflection. If the degree of the density of the air is given, the degrees of these gradations may also be determined—not by mathematical rules, indeed, but by close observation of nature. By aerial perspective two results are obtained:—1. Each object in a picture receives that degree of colour and light which belongs to its distance from the eye. 2. The various local tones are made to unite in one chief tone, which is nothing else than the common colour of the air, and the light which penetrates it. The charm and harmony of a picture, particularly of a landscape, depend greatly upon a correct application of aerial perspective. Aerial perspective is hardly found at all in the productions of the ancient German and Italian schools to the time of Perugino.

The methods of perspective commonly practised are extremely complex and difficult to follow. We shall content ourselves here with giving one or two simple illustrations of the principles laid down in the foregoing.

I. *To draw the perspective of a pavement of squares, two of the sides of the squares being parallel to the base of the picture.*

The squares having two of their sides parallel to the base of the picture, their other two sides will have for their vanishing-point the point of sight, and the point of distance will be the vanishing-point of the diagonals. Set off on the base of the picture at

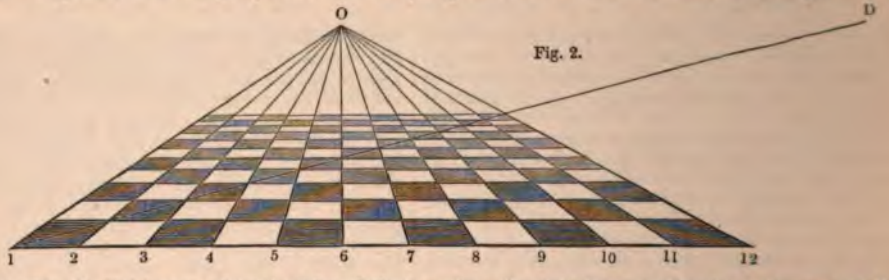


Fig. 2.

1 2 3, &c. (Fig. 2), divisions equal to the sides of the square, draw through these to the point of sight O lines which are the perspectives of the sides of the squares, perpendicular to the picture, and intersect these by a diagonal drawn from any point, as 1 to D, the point of distance, and through the points of intersection draw lines parallel to the base of the picture.

II. *To draw the perspective of a circle.*

Let A B *a b* (Fig. 3) be the projections of the picture, *c c* those of the eye, *o* the point of distance, I J K L the given circle. The most expeditious method of operating is to circumscribe the circle by a square. The circle touches the square at four points; and if the diagonals of the square are drawn they intersect the circle at four other points, which gives eight points, the perspectives of which are easily found. Thus, then, we draw the perspectives of the square and of its diameters and diagonals, and then project on the base of the picture *a b* the points I J K L in K′ and L′ and K″ and L″, and from these points draw the lines K″ *c*, L″ *c*, which cut the diagonals in *i j k l*, and through these and the four others, E F G H, the circle is to be traced by hand. As the circle is a figure which has very frequently to be drawn in perspective, we shall consider it under another aspect. Let there be any number of points taken in the circumference of the original circle (Fig. 3), and suppose lines drawn to

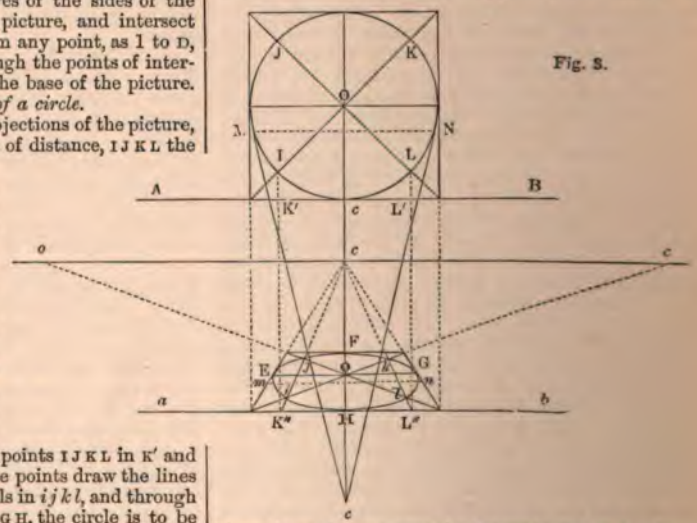


Fig. 3.

them from the eye *c*, as the tangents M *c*, N *c*. Now it is evident that the collection of all these lines forms the projection of a scalene cone, having its

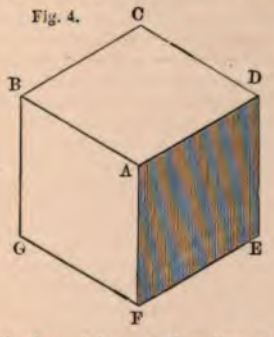
base circular, and its summit in the eye of the spectator. Let us conceive this cone cut by the plane of the picture, and its section in the picture will be the perspective of its base or of the given circle. This operation can be performed by the rules of descriptive geometry, and the result will be the same as by the problem above. The perspective of this circle is, then, necessarily an ellipse, since it is the result of the section of a cone by a plane which passes through both sides, and is not parallel to its base. It is further to be observed that in the ellipse the principal axis *m n* does not pass through the point *o*, the perspective of the original centre of the circle, but is the perspective of a chord M N determined by the tangents M *c*, N *c*.

Isometric Perspective.—This is a conventional manner of representing an object, in which it has somewhat the appearance of a perspective drawing, with the advantage of the lines situated in the three visible planes at right angles to each other, retaining their exact dimensions. For the representation of such objects, therefore, as have their principal parts in planes at right angles to each other this kind of projection is particularly well adapted. The name *isometrical* was given to this projection by Professor Farish of Cambridge.

The principle of isometric representation consists in selecting for the plane of the projection one equally inclined to three principal axes at right angles to each other, so that all straight lines coincident with or parallel to these axes are drawn in projection to the same scale. The axes are called isometric axes, and all lines parallel to them are called isometric lines. The planes containing the isometric axes are isometric planes; the point in the object projected, assumed as the origin of the axes, is called the regulating-point.

If any of the solid angles of a cube (Fig. 4) be made the regulating-point, and the three lines which

Fig. 4.



meet in it the isometric axes, then it may be demonstrated that the plane of projection, to be such that these axes will make equal angles with it, must be at right angles to that diagonal of the cube which passes through the regulating-point. The projection of the cube will therefore be as A B C D E F G in the figure.

PERSPIRATION, or Sweat, the fluid secretion of the *sudoriparous* or *sweat-glands* of the skin. The term 'perspiration' is, however, sometimes used to include all the secretions of the skin, such as those of the *sebaceous glands* or *follicles*, &c. The sweat consists of part of the watery constituents of the blood, separated therefrom by the sweat-glands, and eliminated on the surface of the skin in drops of fluid. The sweat secretion, in ordinary circumstances, is evaporated from off the skin as fast as it appears. But after violent exercise, when the body is exposed to a great heat, even during periods of strong mental emotion, or in certain diseases, the perspiration may collect in greater quantity, and appear in the form of visible drops of fluid. The sweat-glands are situated in the subcutaneous adipose or fat-tissue of the skin. Each consists of a coiled-up tube, forming a glandular structure, which is invested by a capillary net-work of blood-vessels. The tube is continued in a spiral form upwards through the *cutis* or true skin, when it becomes straight and ascends through the *epidermis* to the surface of the skin, where it opens in an oblique valvular aperture. The duct may again exhibit a spiral conformation near its termination on the skin-surface. The duct is lined by epithelial cells, continuous with those of the epidermis itself. The openings of the sweat-ducts constitute the popular 'pores' of the skin. The largest and most numerous ducts are situated in the palm of the hand. Krause estimates their number in this situation at 2736 to the square inch; and Erasmus Wilson states their number at 3528 to the same area. The sole of the foot is also as abundantly supplied; and these ducts and glands occur in less numbers and of smaller size, over the entire body surface. In the neck and back they number only about 417 to the square inch (Krause); and the same authority says that the entire number in the body is 2,381,428. If placed together, the entire sweat-glands would form an evaporating surface of about 8 square inches; that is, reckoning each orifice or sweat-pore to present a diameter of $\frac{1}{250}$th of a line. The 'line' Krause estimates as equal to $\frac{1}{10}$th of an inch.

The *insensible* perspiration of the skin is a term used by physiologists to denote the matters *evaporated* from the skin, and which are thus continually being got rid of without being noticed. The *sweat* itself, collecting in drops on the skin-surface, is termed in opposition, *sensible perspiration*.

The *analysis* of sweat has always formed a matter of dispute, chiefly from the difficulty of obtaining the secretion in sufficient quantity to make an exact estimate of its compounds. In ordinary sweat, water, carbonic acid, and sebaceous matter may be assumed to be the chief constituents. Thenard, analyzing the sweat obtained from a flannel shirt washed in distilled water, found chloride of sodium, acetic acid, phosphate of soda, phosphate of lime, traces of oxide of iron, and an animal substance. Berzelius obtained chloride of sodium, chloride of ammonium, and lactic acid, in sweat from the forehead. Anselmino, in the sweat collected from his own arm placed in a glass-cylinder, found water, carbonic acid, and acetate of ammonia; and from the dried residue or ashes of sweat, he obtained soda, in the form of the sulphate, phosphate, and carbonate, potash, chloride of sodium; phosphate and carbonate of lime; and oxide of iron (traces). A certain amount of *urea* is generally regarded as a normal constituent of sweat-fluid. Gorup-Besanez says that the general and ordinary composition of perspiration is included under the list of water, fat, urea, acetic, butyric, and formic acid, and salts—the latter being chlorides of sodium and potassium, earthy phosphates and sulphates; together with oxide of iron.

The quantity of sweat evolved from the skin has been estimated by Valentin at nearly 1$\frac{1}{2}$ lbs. daily, or 11,744 grains. This calculation is based on the assumption that the exhalation from the respiratory organs and skin together amounted daily to 19,000 grains or 2$\frac{1}{2}$ lbs. From this total quantity 5000 grains are subtracted for the pulmonary exhalation, and 2256 grains for the excess of weight of the exhaled carbonic acid over that of the equal volume of inhaled oxygen; leaving a remainder of 11,744 grains. Lavoisier and Sequin calculated that 18 grains per

minute represent the loss by pulmonary and cutaneous exhalation together. Of these 18 grains 11 are calculated to be exhaled by the skin, and 7 by the lungs. The *carbonic acid* got rid of by the skin is calculated to amount to about $\frac{1}{3}$th of that exhaled by the lungs, this calculation applying to warm-blooded animals only (Regnault and Reiset). In amphibians (frogs, &c.), in which the skin plays a more important part in respiration, the amount of carbonic acid exhaled is much greater than that above stated to occur in warm-blooded animals. A frog, the lungs of which had been cut out, generated by its skin $\frac{1}{4}$ cubic inch of carbonic acid in eight hours. The amount of *watery vapour* secreted by the skin has been roughly calculated to amount to double of that exhaled by the lungs in the same or during any given time. The entire subject of transpiration by the skin shows how very closely connected is that function with respiration or breathing—this fact being more fully touched upon in connection with the subjects of RESPIRATION and the SKIN itself (which see).

PERTH, or PERTHSHIRE, a large central county of Scotland, bounded on the north by Aberdeenshire and Inverness-shire; on the east by Forfarshire; on the west by Argyleshire, Stirlingshire, and Dumbartonshire; and on the south by Stirlingshire, Clackmannanshire, and Kinross-shire, with two small detached portions, one on the northern shore of the Firth of Forth, between Clackmannan and Fife, 5 miles long by about 3 broad; and the other on the south side of the Forth above Stirling, surrounded on all sides by that county. Extreme length, east to west, 63 miles; breadth, north to south, 60 miles. Area by the ordnance survey 1,664,690 acres, of which 32,000 acres are water. Its surface is beautifully diversified with mountain and valley, wood, rock, lake, and river, alternating with wide and fertile plains, in a high state of cultivation. In short, all the more striking characteristics of the finest and most picturesque scenery of Scotland are concentrated in this single county, combined with the most favourable specimens of its pastoral districts. The part of the Grampian chain in Perthshire comprises some of the highest summits in the kingdom, three of which approach 4000 feet above sea-level, while several others are between 2000 feet and 3000 feet; the highest in the county is Benlawers, estimated at 3945 feet. The beautiful and extensive valleys or 'straths' of Perthshire are no less remarkable than its mountains. The principal of these are Strathallan, Strathearn, Strath Tay, Strath Airdle, and Strathmore, the last extending into Forfarshire. Next come its fertile and picturesque glens, Glen Tilt, Glenorchy, Glenfalloch, Glenlyon, and numerous others. The north-west and northern parts of the county belong to the great primitive district of the north of Scotland; many of the mountains, including some of those in the Grampian range, are composed of mica-slate, intermixed with hornblende-slate and quartz rock, and in some parts with a small portion of crystalline limestone. The Ochil Hills, in the south-east part of the county, consist chiefly of porphyry and amygdaloid. The principal rivers are the Tay, the basin of which comprises nearly the whole county; the Forth, Earn, Teith, Lyon, Garry, Tummel, &c. The chief lakes are Loch Tay, a magnificent expanse of water, 16 miles long; Loch Ericht, Loch Rannoch, Loch Katrine, and several other smaller but not less beautiful lakes. The cultivated land in the county in 1881 was 345,788 acres, or less than one-fifth of the whole surface. The most valuable tract of low land is what is called the Carse of Gowrie in the south-east, being the district bounded by the Tay on the south and west, and the Sidlaw Hills on the north. Its soil is mostly a deep rich clay; and in point of fertility it is not perhaps surpassed, if equalled, by any land in the kingdom. The lower part of Strathearn consists of a similar soil, and is hardly less fertile. In the Carse of Gowrie, and other fertile tracts, wheat and beans are the principal objects of cultivation. In the midland districts barley, and in the higher, oats are the principal crops. Potatoes and turnips are also extensively cultivated. Corn crops in 1883 covered 103,050 acres, green crops 50,799, clover and grasses in rotation 100,631, permanent pasture 87,064. Considerable quantities of fruit are produced in the vales, particularly in Gowrie. The cattle in the county in 1883 numbered 73,097, the sheep 696,640—a greater number of sheep than in any county except Argyle and Inverness. The linen and cotton manufacture are carried on to a certain extent in the county; still, on the whole, Perthshire may be regarded as an essentially agricultural district. The fisheries of the Tay are about the most valuable in Scotland. The county returns one member to the House of Commons. Principal towns—Perth, Blairgowrie, Crieff, and Dunblane. Pop. in 1871, 127,768; in 1881, 129,007.

PERTH, a city and royal and parliamentary burgh of Scotland, capital of the county of the same name, beautifully situated on the right bank of the Tay, here crossed by a simple but elegant bridge of nine arches, 880 feet long by 22 feet wide; and at the common junction of railways from Dundee, Aberdeen, Glasgow, Edinburgh, and Inverness, 33 miles N.N.W. of Edinburgh. From whatever quarter it is approached it presents a very striking and attractive appearance, owing partly to its noble river, partly to the verdant slopes and well-wooded hills by which it is surrounded, and partly to its spacious and beautiful meadows, situated on its north and south sides, and called respectively the North and the South Inch; the former skirting the margin of the river, and partly converted into a level race-course, and the latter intersected by the Edinburgh road, surrounded with rows of stately trees and with stately villas. The town, once surrounded by walls, flanked with towers, of which no vestiges now remain, is laid out with considerable regularity, and contains several spacious streets, crossing each other at right angles, and some handsome terraces and crescents. The public buildings include St. John's, a very ancient structure, in the pointed style, with a massive square tower, terminating in a spire, originally forming only one church, but now converted into three parish churches; St. Paul's, also a parish church, of modern erection, with a lofty steeple; an Episcopal church in the cathedral style, and another built in 1858; several Free, United Presbyterian, and other churches; the County Buildings, an elegant Grecian structure, facing the Tay, with a portico of twelve fluted columns; immediately behind it the City and County Prison, the Penitentiary or General Prison, forming one of the largest edifices of the kind in Scotland; the City and County Infirmary, the Royal Lunatic Asylum, finely situated on the north side of Kinnoul Hill; the academy, occupying a handsome building, and furnishing a superior course of education; the grammar and various other schools; the Antiquarian Society, occupying a handsome building called Marshall's Monument, which contains a public library, in addition to the museum of the society; a neat theatre, and infantry and cavalry barracks. The principal manufactures consist of cotton coloured goods, intended specially for umbrella covers; checked and striped ginghams, winceys, and gala plaids, imitation India shawls, many of them for the Turkey market; handkerchiefs, scarfs, and trimmings; ink, carriages, castings, and various articles in iron. There are also several breweries and distilleries, bleach and print fields, dye-works, tan-

neries, rope-walks, a large flax and several flour mills, and building yards, at which both steamers and sailing vessels are constructed. The trade, favoured both by the numerous railways which centre here, and the river, which, in consequence of important improvements, now admits vessels of 300 tons to the town, is large and increasing. The imports from foreign ports, and more especially from the Baltic, are timber, cheese, clover-seed, and linseed; flax, spirits, hides, bark, smalt, madder, tar, bones, &c.; and coastwise, coal, lime, salt, manure, &c. The foreign exports are trifling; but, coastwise, include large quantities of potatoes, chiefly to London, corn, timber, and slates.

Perth is generally supposed to be of Roman origin, and to have had Agricola for its founder. Its earliest known charter is dated 1106; but it was first erected into a royal burgh in 1210 by William the Lion. Till the death of James I., in 1437, it was the capital of Scotland, for which its central locality made it admirably adapted; and both then and subsequently it became the scene of some of the most remarkable events in Scottish history. Among others may be mentioned its capture and the carrying off of its records by Edward I. of England in 1298, the murder of James I. in 1437, the various meetings and events connected with the progress of the Reformation, the repeated visitations of the plague, the Gowrie conspiracy or Raid of Ruthven in 1600; the capture of the town by Montrose in 1644, after his victory of Tibbermuir; its capitulation to Cromwell in 1651, and its occupation, first by Viscount Dundee in 1689 and afterwards by the Highlanders in 1715 and 1745. Pop. in 1871, 25,580; in 1881, 28,980.

PERTH, The Five Articles of, was the designation applied to a famous measure passed in a General Assembly of the Church of Scotland, convened at Perth by the order of James VI. in the summer of 1618. The first of these articles required communicants to receive the elements kneeling; the second permitted the dispensation of the communion privately in case of sickness; the third allowed private baptism on sufficient cause being shown; the fourth required that children of eight years should be confirmed by the bishop, and the fifth enjoined the observance of Christmas, Good Friday, Easter, Ascension, and Whitsunday. These articles were ratified by the Estates in 1621, but they were peculiarly obnoxious to the Presbyterians of Scotland, as well in themselves as from the fact that sinister influences were employed to get them passed, and the opposition to the introduction of the innovations was of the keenest description, and never relaxed so long as efforts were made to introduce them. In the assembly held at Glasgow in 1638 the assembly of Perth was declared to be unlawful and null, and the Five Articles were formally condemned.

PERTHES, Friederich Christoph, a celebrated German publisher, was born at Rudolstadt on the 21st April, 1772, and having early lost his father, was received as an apprentice by Böhme, a bookseller of Leipzig, in 1787, and subsequently, in 1793, obtained a place as assistant in the establishment of B. G. Hoffmann at Hamburg. Here in 1796 he commenced as a bookseller on his own account, and devoted himself assiduously to his vocation, bringing to it a clear business intellect and an enthusiastic ambition to promote the interests of Germany and German literature. In 1797 he married Caroline, eldest daughter of Matthias Claudius, editor of the Wandsbecker Bote, and the following year he formed a partnership with John Henry Besser, a brother-in-law of his own, under whose coadjutorship the bookselling concern soon attained the position of the first in Germany. His patriotism and zeal for the independence of his native country brought him in contact with many of the most eminent men of the time, including John and Adam Müller, the brothers Schlegel, Arndt, Niebuhr, Stein, Nicolovius, and others. During the French occupation, however, of Germany his business suffered severely, and he was latterly obliged to flee from Hamburg, but returned thither on the overthrow of Napoleon in 1814. The difficulties in which he found himself involved were manfully surmounted by his own unaided efforts, declining to avail himself of the numerous offers of assistance which he received. On the death of his wife he removed in 1821 to Gotha, handing over the Hamburg business to Besser, and established in the former town a publishing concern, which rapidly prospered. The works undertaken by him were chiefly historical and theological, and much of the evangelical literature of Germany, including the writings of Neander and Tholuck, issued from his presses. He died on the 18th May, 1843. An interesting life of him has been published by his son, Clemens Theodor, professor of law at the University of Bonn. An uncle of his, J. G. Justus Perthes, was the first of the family to open a publishing house at Gotha, and died in 1816. He was succeeded by his son, Wilhelm Perthes, who died in 1853, leaving the business to his son Bernhard Wilhelm, by whom it is now carried on, under the firm of Justus Perthes. One special department to which this house devotes itself is the preparation of maps, which are esteemed for their general accuracy. It is from it likewise that the well-known Almanach de Gotha is issued.

PERTINAX, Publius Helvius, a Roman emperor, born, according to Dio Cassius, on 1st August, 126 A.D., at Alba Pompeia (still called Alba), a Roman colony of Liguria, was the son of a freedman. He received a good education, and entered the army, where, through the interest of his father's former master, he obtained a command. He greatly distinguished himself in the war against the Parthians, and afterwards served for some time in Britain, and then in Mœsia, Germany, and Dacia. He had now acquired so much celebrity as to attract the particular attention of Marcus Aurelius, who, entertaining some doubt of his fidelity, recalled him. His exculpation proved satisfactory, and higher honours began to flow in upon him. In 179 he was elevated to the consulate, and received public thanks from the emperor for his services, both in the senate and in the camp. He afterwards commanded the legions on the Danube, and was made governor, first of Mœsia and Dacia, and afterwards of Syria. Here he remained till Marcus Aurelius died. Commodus now became emperor, and being under the complete ascendency of his favourite Perennis, he banished Pertinax to his native Liguria. On the death, however, of Perennis, three years afterwards, Commodus recalled him, and sent him to Britain to quell a mutiny among the legions. He found matters in a deplorable state—all discipline was at an end, and finding that the attempt to restore it only made him obnoxious to the troops, he solicited his recall. Commodus granted it, and after employing him as proconsul in Africa, made him prefect of Rome. When Commodus was murdered, two of the conspirators waited on Pertinax, and made him an offer of the throne. He accepted, though not without hesitation, the perilous position, and was proclaimed emperor A.D. 193. The people saw with pleasure the substitution of a renowned captain for a ferocious and debauched prince. Encouraged by their approbation, as well as by that of the senate, Pertinax sought to make considerable reforms in all branches of the government, but particularly in the army, where he desired to restore the ancient discipline. These proceedings, however, did not meet the wishes of the prætorian guards, who were determined to have no emperor who was not their creature. They accord-

ingly conspired against him, and forcing their way into his palace barbarously murdered him, after he had reigned only eighty-seven days. His death took place on the 28th March, 193.

PERTURBATIONS, the variations produced in the motions of planets and comets round the sun by their mutual attractions.

PERU, a republic of South America, formed out of the former Spanish viceroyalty of same name; bounded on the north by Ecuador, on the south and east by Bolivia, on the west by the Pacific Ocean, and on the east by Brazil. Previous to the war with Chili (1879–83) the territory had an area of about 503,700 square miles and was divided into the eighteen departments of Piura, Cajamarca, Amazonas, Loreto, Libertad, Ancacho, Lima, Callao, Huancavelica, Huanuco, Junin, Ica, Ayacucho, Cuzco, Puno, Arequipa, Moquegua, and Tarapaca, with a total population at the census of 1876 of 2,699,945. By the treaty of peace, however, concluded between the two republics in May, 1883, by which the department of Tarapaca was ceded to Chili, Peru has been diminished by about 15,900 square miles, the present area being therefore 487,800 square miles; pop. 2,657,945. The chief inland towns are Lima, the capital; Arequipa, Cuzco, Huamanga, and Puno; and the principal sea-ports are Callao, Arica, Truxillo, Lambeyeque, Pisco, Payta, Iquique, and Islay.

General View.—This country exhibits great varieties of physical character, and all on a great scale. But from every point of view its grandest feature is the Cordillera of the Andes, which, seen from the coast, has the appearance of a vast wall, apparently impassable. The region between the Andes and the Pacific Ocean has a width of under 100 miles, but of its whole surface only a very small portion is habitable. It is generally rugged, and covered with mountains or hills from 10,000 feet to 500 feet in height, descending rapidly in height from the Cordillera to the sea, and generally consisting of bare rock, wholly divested of life or vegetation. It is only where streams force their way across this tract from the Andes towards the sea that verdure makes its appearance and the cultivation of the ground becomes practicable. Hence this region, in which only the transverse valleys, under favourable circumstances, are fit for the abode of man, is generally distinguished as Los Valles. But the streams from the mountains, though full and rapid above, generally sink in the dry, sandy ground lower down, and seldom reach the sea, while most of them are but occasional torrents, flowing during the rainy season (of the highlands), and dry nine months of the year. On the most favoured portion of the coast these valleys are on an average 12 miles asunder, but they are more frequently separated by intervals of 15 or 20 miles. Towards the north they are more widely asunder, so that between Lambayeque and Sechura there intervenes a dry desert of 90 miles. Above the maritime Cordillera, between the ridges of the Andes, nature assumes quite another aspect, and there, Las Sierras, as the elevated region is generally called, is now the chief, as it was anciently almost the exclusive seat, of the population of Peru. Beyond, or east of the mountains, the country sinks into boundless plains, watered by numberless and great rivers, and covered to a great extent with impenetrable forests. The name given to this country, which is but imperfectly known, is Montaña, or *the wooded region.*

Mountains and Highlands.—The Andes of Peru (see ANDES) include the nearly extinct smoking volcano of Arequipa and numerous other lofty peaks, forming two ranges, between which is the table-land or sierra, naturally distributed into regions differing widely in character. The chief are the heights of Pasco, of Cuzco, the valleys of the Rio Jauja and of the Marañon. The first of these lies at one of those points where the branches of the Andes unite, the ridges sinking into an elevated plain, which has here a general height of 14,000 feet. This region is traversed by chains of hills from 500 to 1000 feet high, and has everywhere a rugged and forbidding aspect. Though the climate is the most disagreeable and comfortless possible, and the distress arising from difficulty of respiration is severely felt, yet the veins of the precious metals, with which this region abounds, have attracted to it a comparatively dense population; and it has been more frequently visited and more fully described by strangers than the smiling and luxuriant regions lower down. The table-land of Cuzco, extending from the southern frontier of Peru to lat. 12° 30′ s., has a length of about 150 miles and a width of 100 miles. At the city of Cuzco, lat. 13° 30′ s., it has an absolute elevation of 11,380 feet, but sinks rapidly towards the north, so that at the banks of the Rio Mantaro it is not probably more than 8000 feet above the sea. On the heights of Pasco there is no cultivation whatever. But here, between the southern and most elevated part of Cuzco, where the quinoa (*Chenopodium quinoa*) is cultivated, and the plantations of sugar-cane in its northern parts, we find most of the grains and fruits of Europe in the greatest perfection. The valley of the Jauja adjoins the table-land of Pasco, descending rapidly south about 100 miles, and resembles in general character the lower portion of Cuzco. It is perhaps the most populous portion of Peru and at the same time the least known. The valley of the Marañon, from lat. 10° to 5° s., is for the first 100 miles little more than a narrow defile descending rapidly; it then becomes for 200 miles a wide and fertile valley, having a mean absolute height of about 3000 feet. The Pongo or gorge of Rentema at its northern termination is but 1250 feet above the sea. A great portion of this valley has all the characters of the tropical regions.

Lakes and Rivers.—The lakes of Peru are of little importance. The largest, Lake Titicaca, is only partly in Peru, the remainder being in Bolivia. This lake is the largest in South America. On the table-land of Pasco lie at no great distance asunder the Lake of Llauricocha, whence issues the Marañon; the Lake of Chiquiacoba, 13,200 feet above the sea, from which the Huallaga flows. The chief rivers of Peru are the Marañon, which rises in the lake above mentioned, the Huallaga, and the Ucayale, which join the Marañon, the Ucayale being about the same size as that river. The Marañon flows for 400 miles between the Cordilleras of the Andes; during the first 150 miles of its course it descends about 10,000 feet. Below the rapids at Tomependa, close to the Pongo of Rentema, the river flows north-east and then east for 150 miles till it descends the rapids, 7 miles in length, at the Pongo of Manseriche. At the foot of these rapids is the town of Borja, in Maynas, a province of Ecuador, whence it may be navigated downwards in small vessels. Its subsequent course, during which it forms the northern boundary of Peru, may be described as easterly, though there are many windings. The Huallaga on leaving the highlands takes a tortuous course of 500 miles, collecting numberless small streams till it joins the Marañon in lat. 5° s. and lon. 76° w. It flows for the most part between hills covered with dense forests, but for the last 100 miles it winds through level, marshy plains. Its general course is north-westerly, as is also that of the Ucayale, so that these rivers, along with the upper Marañon, run generally speaking parallel. The Ucayale is formed by the united waters of a number of rivers. The chief of these is the Apurimac, which being joined by the Mantaro, called during part of its course the Jauja, forms the Ene, and this again is

joined by the Perene. The Ene is joined by the Vilcamayo, called also the Urubamba, these two streams forming the Ucayale. The Ucayale, just below the junction, descends a violent rapid called Vuelta del Diablo. Among its chief tributaries from the mountains is the Pachitea, which is reported to be navigable a long way up, so that were it not for the fierceness of the wild tribes inhabiting its banks and the difficulty of dislodging them from their impenetrable forests it might afford a convenient access to the central portion of Peru.

Climate.—The very peculiar climate of the maritime region of Peru excited the wonder of the European discoverers of that country, and remains to this day but imperfectly explained, yet may be accounted for by the position of the mountains and prevailing winds. On a portion of that coast no rain has fallen within the memory of man; and on most of it a shower of rain is a remarkable phenomenon, generally supposed to be concomitant with an earthquake. For six months, from November to April, the sky is cloudless, and the burning rays of an almost vertical sun would convert the country into bare rock or dust if it were not that this is the rainy season in the higher regions, whence copious streams pour down to fertilize and beautify the valleys. These torrents soon dry up on the cessation of the rains in the mountains; but then the sky along the coast becomes overcast, the heat of the sun is intercepted by a thick mist, called *garua* which falls like a heavy dew, and freshens the vegetation, while it mitigates the heat. The cool oceanic currents and the streams of air descending from the snowy heights of the Andes can with their united influence only mitigate agreeably the heat of the coast, which on the sea-side is often excessive. In Lima, 600 feet above the sea, the thermometer varies from 60° in winter to 82° in summer. In the region refreshed by the *garua* or small rain, extending to the height of from 1500 to 2000 feet above the level of the sea, various tropical plants, including the banana, sugar-cane, cotton, and sweet-potato, grow with considerable luxuriance. To this zone succeeds the perfectly rainless region, reaching to the elevation of about 7000 feet, where it is bounded by the rain-line. This region, which is absolutely rainless, consists of piles of barren granite rocks, broken, however, by narrow valleys formed by the mountain streams, in which the orange, plantain, and other tropical fruits ripen. These valleys or ravines give access to the region of the *Sierra*, which lies above the rain-line and constitutes the temperate zone of Peru. Vegetation produced by the influence of natural rain now first begins to clothe the western side of the Andes. Pastures likewise appear, at first scanty, but gradually increasing in luxuriance, in conjunction with the growth of wheat, barley, maize, potatoes, fruits, &c., which are cultivated on the temperate plains and slopes of the Sierra up to the height of 10,000 feet. From the upper limit of this zone to the height of 14,500 feet extends the domain of grasses, with a character wholly alpine, peat-mosses often covering a great extent. The country in general is available only for sheep pasture. Still higher up alpine plants and lichens continue to flourish to an elevation in sunny aspects of perhaps nearly 17,000 feet. If we proceed to the eastern slope of the Andes we find there an important general change in the elements of climate. On the western side the prevailing wind during nine months of the year is from the south-west. The south wind predominates during the other three months. These winds are both cool and dry. But east of the Andes the regular equatorial winds from the east come loaded with humidity, and, checked by the mountains, pour down copious, and in some places perpetual, rains. The western side of the Andes is almost destitute of trees, with the exception of a few belts of wood in the ravines or along the rivers that traverse the valleys at the foot of the mountains. On the eastern side the tall forests cover the low plain, and ascend with hardly diminished magnificence to a height of 5500 feet, where the tropical character of the woods ceases. The temperature on the eastern side of the Andes is higher than that on the western, making a difference in the limits of the vegetable zones of about 2000 feet (6° or 7° Fah.); and at the height of 3000 or 4000 feet, *la ceja de la montaña*, the brow of the forest, as it is termed by the Peruvians, presents one of the most charming spots on the earth, enjoying a delicious and equable temperature, matchless fertility, with forest and mountain scenes of incomparable grandeur.

Earthquakes.—The coast of Peru enjoys a perpetual aerial calm; its atmosphere is never darkened or disturbed by heavy rains, by thunderstorms, or hurricanes. But, on the other hand, it is peculiarly subject to subterranean convulsions. Earthquakes have frequently laid Lima in ruins, and experience shows that forty-five smart shocks may be expected there in a year. Desolating earthquakes have frequently occurred. In 1746 the sea retired to a great distance; then suddenly rushing back overwhelmed the town of Callao. Of its inhabitants, about 3000, only sixteen survived the catastrophe. On August 13th, 1867, the whole country was visited with another terrific shock. Iquique was swept utterly away by the sea, and Arequipa and many other places were destroyed, with a loss of 20,000 lives.

Geology.—Accurate geological observations have as yet embraced but a small portion of the wide surface of Peru. Red sandstone, frequent on the coast, is also the prevailing rock in the plains of the interior, where it is accompanied by vast deposits of rock-salt, the latter occupying, in the valley of the Huallaga alone, an area of 1000 square miles. It occurs also on the coast, and is not wanting even on the heights of the Andes. Granite and porphyry, appearing on the coast, extend also to the highlands; but the prevalent rocks on the sierras are trachyte, augite, porphyry, and diorite. The sides of the valleys between Titicaca and Cuzco are formed chiefly of clay-slate. Round Arequipa, and thence to Titicaca, the soil is all volcanic, yet there is no active crater in the neighbourhood, though the cone of Arequipa still emits smoke. In the south of Peru, chiefly in the maritime province of Tarapaca, and in the neighbourhood of Iquique, an extensive deposit of salt, nitre, and nitrate of soda exists; the sandy region over which it extends, nearly 3° (lat. 19° to 22° s.) in length, north to south, is a barren desert. In many parts the houses and inclosures for cattle are built of blocks of salt. The observations of Mr. Darwin have led him to the conclusion that the coast of Peru has risen 85 feet since it was first inhabited. Since the great earthquake of 1746 the coast near Lima, which was raised on that occasion, has been constantly sinking. The water-courses further in, near the base of the Andes, furnish abundant proof of natural convulsions, many of them exhibiting the wear of centuries being now laid dry.

Mines.—It is said that gold may be found in all the passes, and nearly all the rivers from the Andes wash down auriferous sands. The richest gold mines or diggings are about Huaylas, 70 miles south-east of Truxillo, and Tarma, 110 miles north-east of Lima. It is difficult to estimate the amount of gold annually obtained, the business of washing the sands being carried on almost wholly by Indians, without capital or machinery, and with much secrecy. Little of the gold is coined, and probably the larger portion of it

is smuggled to the coast. Silver also, which is the chief metallic production of Peru, is very widely distributed, and small mines of it are worked secretly in all parts of the country. But the chief mines of silver, which, having attracted the attention of capitalists, and become centres of industrious population, are fully known, are those of Hualgayoc, near Micuipampa; Hualanca in Huamalies, Pasco, Lucanas, and Huantajaya. The treasures contained in the Cerro de San Fernando, at Hualgayoc, were first discovered in 1771. There are now 1400 *bocaminas* or pits opened in the hill, through which veins of silver run in all directions. Cerro de Pasco is hardly inferior in mineral wealth to Potosi in Bolivia. The town stands at the height of 13,673 feet above the sea, and the hill on which it stands is all hollowed out, so that were not earthquakes here very rare the whole would be soon reduced to a heap of ruins. Most of the bocaminas or mouths of the mines are within the houses of the miners in the town itself; some of them serve as dwellings. They are generally shallow, and not above 500 out of some thousand openings deserve the name of shafts. In the Cerro de Pasco are two very remarkable veins of silver; the one going from north to south has an ascertained length of 9600 feet, with a breadth of 412 feet; the other, stretching W.N.W. to E.S.E., is 6400 feet long and 380 feet wide, and is supposed to intersect the preceding vein exactly under the market-place in the town. The silver produced from the time of the occupation of Peru by the Spaniards to 1875 is estimated by Dr. Adolf Soetbeer of Göttingen in his work on the production of the precious metals (Gotha, 1879) at £280,998,000. The great height at which the mines are in many instances situated, the impossibility of conveying machinery to them on the backs of mules, the want of timber, the high price of all the necessaries of life, present great difficulties in the way of carrying on mining operations with spirit and profit. Quicksilver is abundant, and chiefly found at Huancavelica in the interior; copper, lead, and iron are also found in various places; but in a country where the cost of carriage is so excessive none but the most precious products can yield a profit. Good coal is found at Cerro de Pasco, at an elevation of 14,700 feet. Brown coal is also found on the sandy deserts of the coast, north of Arica; and in the province of Tarapaca lies a buried forest underneath the sand, the wood of which is neither charred nor petrified. It affords excellent fuel, and is much used in the preparation of saltpetre, the chief production of that coast.

Vegetation.—In botanical species Peru is incomparably rich, owing to the various natural regions comprehended in it, each of which has its own flora. West Peru is poor in plants, especially in trees; east of the Andes the species are exceedingly numerous, and most of them affect the arborescent form. The character of a tropical vegetation becomes more perfectly developed as we descend the mountains, and in the plains the forests closely resemble those of equatorial Brazil. On the higher parts of the Eastern Andes are to be found the representatives of families (as the gentians) which are elsewhere rare in South America. On the west coast palms are hardly ever found wild; the cultivated species are the juboa from Chili, the date-palm, and the cocoa-nut. On the east side each of these kinds has many and varying representatives; the tree-ferns also are peculiar to the lower slopes and plains east of the Andes. Among the characteristics of the forests on this side may be mentioned the prevalence of the chinchona or cinchona trees, which occur nowhere else in such numbers and variety. From these forests Peru derives in general little advantage. The Peruvian or Jesuit's bark (from which the well-known febrifuge quinine is extracted), obtained from the chinchona-trees, is almost the only article drawn from them for exportation. Another production which thrives in the same zone as the chinchona, but extends much lower down, and succeeds best in the plains and swamps in the hottest places, is the coca (*Erythroxylon coca*), the leaves of which are chewed as a stimulant by the Indians, and which, being consumed in immense quantities, is a very important article of the inland trade. Tobacco, formerly monopolized by the crown, is now generally cultivated, and being excellent, finds a ready sale in Chili. The sea-board also produces excellent sugar, which not only supplies home wants, but is largely exported. Cotton also is produced in considerable quantity, and is nearly all exported. Fruits are abundant—the banana, orange, pine-apple, papaya, chirimoya, palta, &c., as well as culinary vegetables and grains, from the yam and yuca to barley and the oca, which latter grow at an elevation of even 13,000 feet. The vine is cultivated on the west coast merely for the production of brandy. Agriculture in Peru is in the lowest condition, the excessive dryness of the west coast, the natural barrenness of the sierras, the remoteness of the Montaña, or east side of the Andes, with the deficient means of internal communication, all tend to discourage its progress.

Zoology.—Extensive tracts may be found on the west side of Peru in which life seems to be wholly extinct, and not even insects are found in the sand. Yet that region has animals peculiar to it, namely, a fox, very destructive to flocks of sheep; a mephitic animal or polecat, an otter, some opossums, and gigantic seals. The birds of West Peru are few, with exception of the sea-fowl, which inhabit the shores in countless multitudes. A few deer and wild swine, which attain a great size in the valley of Lima, are the chief mammals; iguanas and lizards are the chief reptiles; the serpents are small and rare, and excepting one species, harmless. The llama is found only on the highlands, where the poor Indians, unable to purchase or support mules, still employ it as a beast of burden. The kindred species—the guanaco, the alpaca, and the vicuña—remain wild in the mountains. Above their haunts are to be found only marmots in the hollows, and the condor nestling in the highest rocks. Of the animals inhabiting the forest region the only one that braves the cold of the sierras is the puma, or lion, as it is often called, which sometimes attacks the sheep on the highlands, and occasionally extends his excursions even to the coast. The eastern face of the Andes is as remarkable for its abundance as the western for its want of animal life. Parrots on the west are few, on the east they are disagreeably numerous. About twenty species of them are found in this region; and here also in the forests the monkeys are innumerable, only one species, the black coaiti, ascends as high as the Ceja (about 4000 feet). At this elevation is found also the South American bear; the larger animals, the tapir, sloth, ant-eater, armadillo, &c., belong to the low forest. Here also insects grow numerous, and on the banks of rivers are insupportable. Alligators swarm in the rivers, and in the inundated plains the boa-constrictor attains a terrific size. Pastoral husbandry has made as little progress in Peru as agriculture, and, indeed, it is equally repelled by the natural circumstances of the country. In the maritime region the scarcity and dearth of water, as well as of fodder, make it impossible to keep cattle. All the lucerne which can be grown by irrigation barely suffices for the mules, which are indispensable. On the eastern side, where nature is more bounteous, the insects, and still more the vampire bat, are fatal to cattle. A considerable number of cattle, however, are reared in some parts

of the sierras which abound in rich pasturage. In Huamanga and Cuzco likewise are to be found good herds of cattle, and some attempt at dairy farming. The feeding of sheep on the uplands is for the most part abandoned to Indians.

Trade and Commerce.—Peru exports chiefly precious metals, guano, cubic nitre, alpaca and sheep's wool, cinchona bark, chinchilla skins, hides, straw hats, &c.; and imports all kinds of manufactured goods, wines, tobacco, and spirits. With the interior and the neighbouring states a trade is carried on in brandy, grain, coca, tobacco, &c., besides the chief articles already named. Two-thirds of the foreign trade are carried on with Great Britain, from which cotton goods are imported in large quantities. The quantity of guano exported to Great Britain has varied greatly in recent years: in 1870 the quantity was 243,434 tons, the value £3,248,293; in 1871, 142,365 tons, valued at £1,711,176; in 1872, 74,401 tons, valued at £875,882; and in 1882, 26,277 tons, value £231,078, the marked decrease in the latter year being due to the fact that Chili is in actual possession of the Lobos Islands and the other chief sources of Peruvian guano. Of higher importance now as an export to Great Britain is cubic nitre, the quantity of which in 1882 was 1,482,522 cwts., the value £976,006. The total imports of Peru average £5,000,000, the exports over £6,000,000. The internal trade of the country has been greatly advanced by lines of railway to the ports, carriage roads, and lines of telegraph. At the end of 1877 there were open for traffic or in course of construction 2030 miles of railway, 1281 miles of which belonged to the state.

Money, Weights, and Measures.—The chief money denominations are the *sole* = 100 *centesimos*, the average rate of exchange for which is 3*s.* 9*d.*, and the *peso* or dollar = 10 *dinero*, average rate of exchange 4*s.* The chief weights and measures are the *libra* or pound = 1·014 lb. avoirdupois; the *quintal* = 101·44 lbs.; the *arroba* of 25 lbs. = 25·36 lbs. avoirdupois; the *arroba* of wine or spirits = 6·70 imperial gallons; the *vara* = ·927 yard; the *square vara* = ·859 square yard.

Government, Revenue, &c.—The present constitution, adopted in 1867, is modelled on that of the United States. The legislative power is in the hands of a senate and a house of representatives, the senate being composed of two senators for each province, and the house of representatives containing one member for every 20,000 of the population. The president is the head of the executive, and is assisted by two vice-presidents. The actual revenue in the year 1875–76 amounted to £13,320,333, and the expenditure to £13,012,624. The foreign debt amounts to £49,010,000; and there is an internal debt, floating and other, of about £9,600,000.

The Peruvian army was stated to number 13,200 men in 1878; but several times this number were under arms in the war against Chili. The navy, once the most powerful on the Pacific coast, was practically destroyed by the Chilians.

People, Habits, Education, Religion.—Fully a half of the population are probably Indians, a fourth white men or creoles, and the rest chiefly coloured people of mixed breed (mestizos). The Indians are spread over the whole country, but are most numerous in the Sierra region or low chasmy mountain land west of the Cordilleras, and the Puna region or elevated valley lying between the inner and outer Cordilleras. With the exception of the wild and little known Indians of the eastern plains, they all belong to the so-called Ando-Peruvian race, and are divided into two great tribes, the Quichuas and the Aymaras, the former found mainly in the north, and the latter forming the bulk of the population in the south of the state. By the laws of the republic the Indian is on a level in political rights with the white men, yet the creole, though conscious of his own enervation, still looks down with contempt on the Indian. The Peruvian creole is tall, but slender and feeble; while levity, fickleness, and incapability of mental labour show his want of moral strength. The creole females lose their bloom totally at an early age. Chinese coolies have been introduced, and are employed mainly in the guano diggings and sugar factories. They number about 50,000. Education is in a low condition in all classes, and among the lower orders is wholly neglected. By the terms of the constitution of 1867 there exists absolute political, but not religious freedom, the charter prohibiting the public exercise of any other religion than the Roman Catholic.

Language.—The group of Peruvian languages is commonly known under the name of *Quichua;* and comprises all the languages and dialects which were spoken in the ancient empire of the Incas. It is usually divided into two principal classes—the one called the *Aymara*, and the other the *Quichua*, or Peruvian proper. The language of a people who had arrived at a high degree of civilization, the Peruvian is one of the most perfect of the South American idioms, it is harmonious and sonorous, and lends itself with equal facility to the requirements of poetry and of eloquence. Peruvian comprises five principal dialects: the *Ouiteña*, spoken in the environs of Quito; the *Lamano*, spoken at Truxillo; the *Chinchaisuyo*, at Lima; the *Calchaqui*, at Tucuman; and lastly, the most important of all, the *Cuzucano*, at Cuzco, the ancient residence of the Incas. It is a remarkable fact that the Peruvian language still maintains itself alongside of the language of the conquerors, notwithstanding that it has undergone considerable modifications through its contact with the latter; most of the Spaniards themselves seem to make it a point of honour to acquire a knowledge of the aboriginal tongue. According to the reports of the missionaries, the Peruvians possessed a rudimentary system of writing analogous to that of the Mexicans, but no remains of it seem to have survived the European invasion. All its literature consists of not an inconsiderable number of religious and pedagogic works (grammars, dictionaries, catechisms, &c.).

Ancient Architecture, &c.—The ruins of edifices still existing in some parts of Peru, and the descriptions left us by the historians of the Spanish conquest sufficiently attest that architectural art was not entirely unknown to the Peruvians. They built palaces and temples, but the art displayed is of a very rude description, and such as might be practised by a nation ignorant of some of the commonest mechanical appliances known for so long a time in the ancient world. Their edifices did not usually reach an altitude of more than 10 or 12 feet, they were built of unhewn stones of various shapes and sizes, put together without mortar, of the use of which they were ignorant, but not without some skill. The temples and palaces were generally built square, without windows, and lighted from above. They were evidently ignorant of the arch, as it is never met with in any of their edifices. Ruins in a good state of preservation are still to be seen at Cuzco, Pachacamac, Cayambo, Tiahuanacu, Cañar, and near Latacunga. The sculpture of the ancient Peruvians was extremely rude, as is evidenced by the numerous specimens in the form of statues still existing. They were more advanced in the arts of founding metals and in carvings; some of the spoils taken by the Spaniards evince considerable skill in these arts.

Traditions, Religion, &c., of the Ancient Inhabitants.—In the most remote times, according to Peru-

vian tradition, there was neither day nor night. The god Viracocha, having issued from the Lake of Collasuyu, proceeded to the province of Tiahuanacu, and created first the sun, and then the planets and stars. His companions, settled in the valleys of Peru, having disobeyed him, he came forth a second time from the lake and changed them into stones. After having thus depopulated the earth Viracocha determined to form a new race of men. He took other stones, and enduing them with life, thus gave birth to men and women, and to the companions whom he had with him he said, 'Look at the figures that I have made, and go into different countries; men will issue from fountains and rocks as soon as you have called them.' They obeyed their instructions, and found it to happen even as they had been told; and thus the earth was peopled. Viracocha himself traversed various places, and assisted in the work of peopling the earth. At one place men fully armed came forth at his command, and, not recognizing their creator, threw themselves upon him with the intention of killing him; but he, foreseeing their intention, brought down fire, which desolated the Cordilleras. The Indians repented, and worshipped him, and the god pardoned them, saying, 'I am the lord your god; it is I who have created the sun and the stars.' The Indians erected a temple on the spot where this occurrence took place, and brought offerings of silver and gold to the powerful Viracocha. When the god had reached the celebrated valley where the capital of Peru was afterwards to be built, he appointed a commander for the whole country. This place was called Cosco, and later Cuzco. From this chief issued the race of the Incas, sons of the sun. After this, Viracocha came to the sea, and walking on its surface towards the horizon, there disappeared. According to the historian Garcilaço, before the arrival of the Incas civilization had made no progress amongst the Indians. The races, still barbarous, were without laws and without morality, having no political organization, and ignorant of even the simplest and most useful arts. They worshipped everything they saw, plants, stones, animals; they offered human sacrifices, sometimes even sacrificing their own children, and generally gave themselves up to magic arts. The worship of the sun seems to have been practised anterior to that of Viracocha; but the latter would seem to have been established at a very early period in Peru, and was subsequently adopted by the Incas. The sun, however, continued to be adored, but only as a symbol of Viracocha or Pachacamac, the supreme being and creator of the world. After the sun, the moon and stars, as also thunder, came in for a share of adoration. The priests of the sun in Cuzco were all of the blood-royal; in the provinces they belonged to the most illustrious families. The high-priest was always the brother or uncle of the inca, and he it was who regulated all matters pertaining to religion. There existed in Peru, as in Mexico, numerous convents for virgins, the principal being at Cuzco. The rules in these were very strict, and if a virgin broke her vow of virginity she was forthwith punished by being buried alive, and not only suffered herself, but drew down upon her kindred and neighbours the same fate. Besides the priests of the sun there were a number of inferior priests, who had no specific functions to discharge, but for the most part traded upon the credulity of the people, through the practice of magic arts. The Peruvians made considerable progress in astronomical science. Their year consisted of 365 days, and was likewise divided into twelve months. In accordance with an edict of the Inca Pachacutec, three feasts were celebrated, at equal intervals of time, in the course of each lunar month, and on these days cessation from all kinds of labour was strictly enjoined. Other feasts were held on stated days throughout the year, when sacrifices of various kinds of animals were offered up. Human sacrifices entirely disappeared under the rule of the Incas.

Ancient Government, &c.—The Empire of Peru, under the Incas, was divided into four parts, corresponding to the four cardinal points. The whole population was divided into decurias or tens, one out of each decuria being appointed as head of the remaining nine. Five decurias had at their head a decurion; each ten, fifty, and a hundred decurias had likewise its chief, varying in rank according to the number of decurias under him. Each officer had particular duties prescribed to him with reference to the well-being, &c., of those over whom he presided, and was bound to report to his superiors. In all the important centres of population there was a supreme judge to hear cases; and on certain occasions a special judge was appointed by the Inca. In regard to political administration each province was presided over by a chief, whose dignity was hereditary. For each of the four great divisions of the country there were councillors of war, of finance, and of justice, presided over by a viceroy delegated by the Inca. These viceroys required to be of royal blood. Marriage was, properly speaking, only a civil ceremony, and every two years the maidens of Cuzco had the rite celebrated by the Inca himself. The age at which marriage could be consummated was, for males twenty-four, and for females eighteen. Widows were forbidden to re-marry if they had children. The brother of the deceased was, as among the Jews, required to marry his sister-in-law. The use of money was unknown in Peru, and commercial transactions were conducted by barter. There were no transactions in land, as all the soil belonged to the Inca. The women were occupied principally with spinning and weaving, and the men with agricultural pursuits.

History, Constitution, &c.—In 1526, when the Spaniards made their first appearance in Peru, Huayna-Capac, the twelfth monarch of the Inca dynasty, was reigning. On his death, in 1529, the kingdom was divided between his two sons Huascar and Atahualpa, but this resulted in a civil war, in which the party of Atahualpa proved victorious. It was at this period (1531) that Pizarro, a Spanish adventurer, disembarked in Peru. Huascar joined forces with the invader against his brother, whom he regarded as a usurper. Atahualpa advanced to meet them. On his refusing to swear allegiance to Charles V., and become a Christian, the invaders fired upon the Peruvians, and taking advantage of the panic that ensued, massacred great numbers of them, and took the Inca prisoner (1532). Cuzco and the other Peruvian cities gradually fell into the hands of the invaders, until the conquest of the whole of Peru was effected. When wrested by the Spaniards from the Incas, whose dominion extended along the Andes through 28 degrees (lat. 2° N. to 26° S.), it became, with some reduction, one of the four vice-royalties of Spanish America. In 1718 the province, or, as it was called, the Kingdom of Quito, was separated from Peru, and annexed to the newly-created vice-royalty of New Granada. In 1778, again, the provinces of La Plata, Potosi, Charcas, Chiquitos, and Paraguay, were withdrawn, in order to form the vice-royalty of Buenos Ayres. It was the last of the Spanish American colonies which broke loose from the mother country. In 1821 a patriot force of Chilians and Buenos Ayrians, under General San Martin, entered Peru, and after a succession of engagements, obliged the Spaniards to retire into the

interior, when the independence of the country was proclaimed. The contest, however, was obstinately continued, until the decisive battle of Ayacucho in 1824, which was soon followed by the final expulsion of the Spaniards. Its limits remained, for the most part, unchanged by the revolution; the provinces dismembered from it in the north forming at first part of Columbia, and afterwards the Republic of Ecuador, while those on the south were united in Bolivia. In 1836 Peru, harassed by contending factions, solicited the aid of Santa Cruz, president of Bolivia, who came with an army, and succeeded, after a series of sanguinary actions, in tranquillizing the country; whereupon a confederation was formed, composed of North Peru, South Peru, and Bolivia, Santa Cruz being named 'Supreme Protector.' This state of matters continued until 1839, when, in consequence of a bloody battle fought at Yungay, Santa Cruz was driven out of the country, and the confederation brought to a close; and both countries—Peru and Bolivia—returned to their previous limits and forms of government. Since that time the Republic of Peru has had its fair share of those civil dissensions so characteristic of the South American republics. From 1845 to 1851, however, during which time Don Ramon Castilla held the presidency, the country enjoyed tranquillity, and continued to advance in wealth and population, while various public works were undertaken. After this the country fell again into a revolutionary state, and the revolutionary party proving successful, its head, Don Ramon Castilla, was appointed provisional president in 1855 in a newly assembled national convention. Dissensions soon again broke out, and continued for a number of years, and in addition to its domestic troubles a short war with Ecuador broke out; in 1860 a dispute arose with France, which, however, was settled without hostilities, and in the same year with the United States. In 1862 General San Ramon became president, and signalized his reign by many wise measures; but he died in 1863. He obtained a reference of the dispute with the United States to the King of Belgium; put foreign vessels on the same footing with Peruvian, &c. He was succeeded by General Pezet, who continued the wise course of his predecessor. In 1864 Spain, which had never formally recognized the independence of Peru, seized the Chincha Islands, with their valuable deposits of guano, and before agreeing to give them up a treaty had to be signed, by which Peru agreed to pay £600,000 to Spain. This treaty being unpopular, led to a revolution, which deprived Pezet of the presidency (1865), and soon after raised Colonel Prado to the dignity of temporary dictator. The obnoxious treaty was now rejected, and in revenge a Spanish fleet attacked Callao (May 2, 1866) without success. The Spaniards, however, considered their honour now satisfied, and desisted from further efforts. In 1867 a new constitution was issued, and by it Prado was elected president for five years. He was deprived of this office, however, by a revolution the same year. Next year was signalized by the calamity already mentioned—the earthquake which devastated the Pacific coast, causing the death of 20,000 persons, and the destruction of an immense amount of property. In the wake of the earthquake came the yellow fever, which in 1869 raged violently in the country, causing the deaths of large numbers. In 1872 the president Don José Balta, who had been appointed in 1868, was murdered in an insurrection excited by Colonel Gutierrez, who proclaimed himself dictator and dissolved the congress. He did not enjoy his ill-gotten power long, however, being put to death by 'Lynch-law' a few days after. The vice-president Cevallos assumed the executive power, and soon restored tranquillity. Don Manuel Pardo now became president, the first non-military man who ever held the office. He zealously promoted liberal reforms, purified the army from all doubtful elements, endeavoured to reduce the finances to order, and improved the system of education. In August, 1876, he was succeeded in the presidential chair by General Mariano Prado, who continued to advance along the lines laid down by his predecessor, but was greatly hindered in his projects of reform, as Pardo also had been, by the impossibility of restoring order to the finances, and by repeated attempts at insurrection on the part of ambitious adventurers. In the spring of 1879 Peru joined Bolivia in the war against Chili, who has completely defeated both her opponents, annexed the Peruvian district of Tarapaca (see the beginning of this article), and taken possession of the guano deposits of the Lobos Islands.

PERU BALSAM. There are three varieties of this balsam, obtained from certain species of *Myroxylum* growing in San Salvador, Central America. (1.) *White Peru Balsam* is obtained by the pressure of the inner coating and seed of the fruit. When this variety, which is a thick, semi-solid, agreeably-smelling liquid, is allowed to stand in the air, it hardens to a reddish-yellow, translucent, hard, aromatic smelling substance, which is known as (2.) *Dry Peru Balsam.* (3.) *Black Peru Balsam.* This, the ordinary variety of the balsam, is obtained from incisions made in the trees; it forms a viscid, opaque, dark-brown mass, having a specific gravity of 1·15. It has an agreeable vanilla-like odour, a bitter irritating taste, and an acid reaction. When heated, this balsam burns with a smoky flame; when distilled with water it yields cinnamic acid. Peru balsam is used in medicine, and also in perfumery.

PERUGIA (ancient, *Perusia*), a town of Italy, capital of the province of the same name, on the side and summit of a lofty eminence washed by the Tiber, 84 miles north of Rome. It is surrounded by lofty walls, and defended by a citadel; has irregular but spacious streets, and many remarkably handsome buildings. Its chief edifices are the cathedral, a fine bold Gothic edifice of the fifteenth century, and possessed of a valuable library, rich in works and MSS. connected with biblical literature; eight churches, all of them interesting structures; the convent of Sant' Agnese, the confraternità of San Bernardino, the convent of San Severo, containing the first fresco painted by Raphael; and the Benedictine monastery of San Pietro de' Casinensi, a magnificent establishment, with an ancient church, supported by marble and granite pillars taken from a heathen temple, and so rich in pictures as almost of itself to form a gallery; the Palazzo Communale, a majestic edifice of the thirteenth century; the Sala del Cambio or Exchange, no longer required for that purpose, but interesting from the number of fine frescoes with which Perugino has covered its walls; and two fine ancient gates, the one the Arch of Augustus, built of massive blocks of travertine without cement; and the Porta Marzia, an interesting specimen of Etruscan workmanship. Perugia possesses a university founded in 1307, a seminary, cabinet of antiquities, museum, botanical garden, public library of 30,000 volumes, an academy of fine arts, and a lunatic asylum, one of the first in which the efficacy of the system of non-restraint was proved. The manufactures, not of much consequence, consist of velvet, silk stuffs, brandy, &c. The trade is in corn, wool, spun silk, and cattle. Perugia under the Romans was one of the twelve principal cities of Etruria. Having taken the part of Mark Antony in the war between him and Augustus, the latter took and sacked it. It had recovered the disaster when Totila, one of the northern barbarians, took it after

a siege of seven years, and put many of its inhabitants to the sword. Pepin-le-Bref, king of France, took it in the eighth century, and made a present of it to the pope. It suffered much during the contests between the Guelfs and Ghibellines, and both in the fourteenth and fifteenth centuries was fearfully ravaged by the plague. The celebrated painter, Pietro Vanucci or Perugino, though born in Citta della Pieve, long made Perugia his adopted home, and died in it a victim of the plague in 1524. Pop. of town, Dec. 31, 1881, 17,395. The province of Perugia or Umbria has an area of about 3720 English square miles. It is traversed in all directions by offsets of the Apennines. The principal stream is the Tiber, which here receives the Chiascio and Nestore. The soil is fertile, producing in abundance corn, wine, fruits, oil, and silk. Pop. 572,060.

PERUGIA, Lago di, or Lago Trasimeno (ancient, *Trasimenus Lacus*), a lake in Italy, near the eastern frontiers of Tuscany, in the province and 9 miles west of Perugia, about 8 miles long, varying in breadth from 7 miles to 4 miles, surrounded with olive plantations. It contains three islands—Isola Maggiore, Isola Minore, and Isola Polvese; and abounds in fish. It has no visible outlet, and its surface has been gradually rising from the deposit of alluvial matter constantly carried into it. Hannibal gained a signal victory over the Romans near the shores of this lake.

PERUGINO, Pietro Vanucci, surnamed *Il Perugino*, the founder of the Roman school of painting, born at Citta della Pieve in 1446, received the rights of citizenship in Perugia (whence his surname), and at an early age distinguished himself by his works. Bonfigli and Pietro della Francesca are supposed by some to have been his masters. His pictures have much grace, and are particularly successful in female and youthful figures. The turns of his heads are noble, and his colouring is lovely. A certain hardness and dryness in the forms, and poverty in the drapery, were the faults of his age, from which he did not wholly escape. Tranquillity and childish simplicity characterize his works, which are defective in invention. His frescoes are softer and in better keeping than his other productions, as the fine specimens in Perugia, Rome, Bologna, and Florence prove. Raphael is his most celebrated disciple. Perugino is said by his biographers to have been of a miserly disposition, and, notwithstanding the great wealth he acquired, to have lived in a very penurious manner. He married a young lady remarkable for her beauty, by whom he had several children, none of whom, however, embraced their father's profession. Perugino died at Perugia, in December, 1524.

PERUKE. See Wig.

PERUVIAN BARK. See Bark (Peruvian).

PESARO (ancient, *Pisaurum*), a town and seaport of Italy, in the province of Pesaro e Urbino, on a rocky and wooded height near the mouth of the Foglia, in the Adriatic. It is the see of a bishop; is walled, defended by a citadel, and has clean and well-aired streets; a cathedral of little architectural merit, several other churches, more or less enriched with paintings; the ancient palace of the Dukes of Urbino; a library, the mineralogical museum, and a botanical garden. It has no manufactures of any consequence. The harbour, formed by the mouth of the Foglia, has become shallow; but the trade in the wine, fruit (particularly figs), oil, silk, and other products of the district, is considerable. Pop. of town, Dec. 31, 1881, 12,547.—The province of Pesaro e Urbino has an area of 1144 square miles; it lies on the Adriatic between the provinces of Forli and Ancona. It is watered chiefly by the Foglia, Metauro, and Cesano. Pop. 223,043.

PESCHIERA, a town and fortress of Italy, 20 miles north-west of Mantua, situated partly on an island and partly on the mainland, at the southern extremity of Lake Garda, where the Mincio issues from it. It is one of the four strongholds which form the famous quadrilateral of Venetia, formerly the Austrian Quadrilateral. The town itself is otherwise unimportant; it has two churches and a custom-house, with a fair trade. Pop. 2418. Peschiera fell into the hands of the French in 1801, with whom it remained till 1811. In 1848 it was taken by the Piedmontese under King Charles Albert; but was restored with the rest of Venetia by Austria to Italy in 1866.

PESHAWUR, or Peshawer, a town in the Panjab, capital of the province of the same name, on the Bara, 36 miles west by north of Attock, and 12 miles east of the eastern extremity of the Khyber Pass. It is walled and flanked with bastions, but lies at the mercy of a fort which commands it, and has been built apparently with the view of overawing the inhabitants. It has one broad principal street, lined with houses of one story, and communicating with a large open area used for a grain market. A little further east is another open space of a circular form, the prettiest part of the town, surrounded by regularly-built houses, with a circular row of acacias in front. To the right and left of the main thoroughfare described the town covers a large space of ground; the by-lanes are very narrow, dirty, and offensive, and the houses generally miserable in appearance. Salt, nitre, lead, and sulphur are obtained in the vicinity. Peshawur has greatly fallen off both in wealth and population since the beginning of the present century. Since then its once numerous mosques, many built in a splendid style of oriental architecture, have been intentionally polluted by the Sikhs, and are going to decay, while extensive ruins in many parts speak of sudden and recent violence. In the same time the population has fallen from about 100,000 to 79,982. Peshawur is traversed by the great route from Khorasan and Cabul to India through the Khyber Pass; and to guard this route a British garrison is stationed here.

PESHITO (that is, 'simple,' 'true,' or according to some, 'explained') is the name given to a Syriac translation of the Old and New Testaments. Neither the time of its appearance nor its authorship are positively known. It is generally referred to the second century, and appears to be the work of several persons—some Jewish, but most Christian. It is extremely faithful, and approximates very closely to the Septuagint translation; but this approximation is attributed to alterations made in it subsequently to its first appearance, due to the high esteem in which the version of the Seventy was held by the Syrians of Palestine. It possesses high authority, especially in regard to the New Testament, of which it is probably the first translation that was made. Four of the catholic epistles and the Revelation of St. John are wanting. A tolerably good edition of the Peshito is that executed for the Bible Society in 1823 by Dr. Lee.

PESTALOZZI, Johann Heinrich, a distinguished educational reformer, born January 12, 1746, at Zürich, where his father was a physician. He lost his father at the age of six, and his education was superintended by his mother. Even when very young he manifested strong religious feelings, a quick sense of right, compassion towards the poor, and a fondness for young children—qualities which afterwards distinguished him as a man. He had a great inclination for the study of languages and theology, but, after an unsuccessful attempt to preach, he applied himself to the study of law. The perusal, however, of Rousseau's Émile filling him with dislike for the habits of

a learned life, and for the general system of education in Europe, he turned his attention to farming. He studied agriculture with a farmer near Berne, and then bought a piece of land in the neighbourhood, built a house, which he called Neuhof, and began the life of a farmer when he was twenty-two years old. He soon afterwards married, and became concerned, through his wife's relations, in a calico manufactory. In these situations he became acquainted with the moral wretchedness of the lowest classes, and in 1775 began his career of instruction by the admission of the children of paupers into his house. He soon saw himself surrounded by more than fifty children, to whom he was both teacher and father. He had no aid from others, and though he caused his children to work, he had not the practical talent necessary to turn the labour of his little workmen to account. His philanthropic and noble self-denial was derided, his confidence was abused, his own affairs declined, and he was generally considered as a well-meaning enthusiast. But he had formed his purpose, and was not to be diverted from it; and, amidst straitened circumstances, he collected that knowledge of the state of the lower classes which is set forth so admirably in his novel Lienhardt und Gertrud (1781, four vols.)—a work which has exerted a remarkable influence. Other writings of his are alike numerous and important, and contain further elucidations of his principles. The want of all support at last obliged him to give up an undertaking which was too great for the means of an individual. In 1798 he established a school at Stanz, but circumstances obliged him to abandon it, and he now took charge of a school at Burgdorf, where he also received pupils who paid for their instruction, so that he was enabled to employ able assistants. This institution flourished, and in 1804 he removed it to München-Buchsee, near Hofwyl in the canton of Bern, where he entered into a nearer connection with Fellenberg, and in the same year to Yverdun, in the Pays de Vaud, where he occupied the castle given to him by government.

The grand principle that lay at the basis of Pestalozzi's method was that of communicating all instruction by direct appeal to the senses and the understanding, and forming the child by constantly calling all his powers into exercise, instead of making him a mere passive recipient, selecting the subjects of study in such a way that each step should best aid the further progress of the pupil. It was not the acquisition of skill in reading, writing, &c., but the exercise of the powers of the child by means of these subjects, which Pestalozzi made the object of elementary education. The principles of his method are clearly developed in his Wochenschrift für Menschenbildung. The value of these principles, as well as the esteem in which they are now held, though they were at first the subject of much controversy, may be gathered from the fact that they are substantially at the basis of the normal school system of Europe. In 1818 Pestalozzi undertook a new edition of his complete works, the proceeds of which he destined for a new school for poor children. He died February 17, 1827, at Brugg, in Aargau.

PESTH, Pestinum, or Pest, the most populous town of Hungary, on the east or left bank of the Danube, across which it communicates with Buda or Ofen by a noble suspension-bridge, 137 miles east of Vienna. It stands on a flat, and consists of the town proper and of four suburbs. The former is irregularly built, and has dark narrow streets, the gloom of which is occasionally relieved by handsome mansions. The suburbs, mostly of modern construction, are much more agreeable and regular, particularly the one called Neustadt or Leopoldstadt, forming the northern division of the town. The new market-place within it is remarkable for its extent, and the regularity and beauty of the buildings by which it is surrounded. The largest building of Pesth, called the Josephinische or Neuegebäude, is in this division, and forms a huge pile, used partly as artillery barracks and partly as military magazines. One of the finest parts of the town is the bank of the river, along which a quay about 1½ mile long has been erected, and lined with handsome lofty houses. The public edifices most deserving of notice are the parish church, a Gothic structure; the university, with forty professors and 1000 students; the church attached to the university, one of the handsomest in the town, with a lofty tower and fine frescoes; the national casino, national theatre, capable of admitting 3000 persons; the museum, the cabinet of coins and antiquities, the university library, with 60,000 volumes; the county buildings, observatory, botanical garden, gymnasium, school of design, normal high school, English female institute, the house of invalids, and several other hospitals and benevolent endowments. The manufactures consist of silk and cotton goods, musical instruments, snuff, beet-root sugar, leather, jewelry, &c.; and the trade which makes Pesth, after Vienna, the most important commercial town on the Danube, is chiefly in corn, wine, wool, wood, and cattle. Pesth is the seat of the chief judicial tribunals, called the Königliche Tafel and Septemviral Tafel, which together constitute the supreme appeal court of the kingdom. Near it is the Rakosfeld, a plain where the Diet, the great national assembly of the Magyars, used to be held in the open air, and the deputies, attended by their vast retinue of vassals, sometimes swelled to the number of 100,000 men, who encamped in tents during the continuance of the sittings. At the first of these assemblies, held in 1458, Matthias Hunyades was elected king. The Rakos is famous for its annual horse-races. In 1873 Buda and Pesth were united into one municipality under the name of Buda-Pesth, which had a pop. in 1880 of 360,551.

PESTILENCE. See Plague and Cholera.

PETAL, among botanists, an appellation given to the leaves of the corolla, in opposition to those of the calyx, called *sepals*, and to common leaves.

PETALITE, a mineral first discovered in the mine of Uto, in Sweden, and interesting as the substance in which the new alkali lithia was discovered by Arfoedson in 1818. It is possessed of the following properties: massive; fracture splintery and imperfectly conchoidal; lustre resinous; colour white, occasionally tinged with red or blue; translucent; tough; hardness the same with that of felspar; specific gravity, 2·439. It is a silicate of aluminium and lithium, containing about 77 per cent. of silica, with 18 or 19 per cent. of aluminium, and from 2 to 5 per cent. of lithium. This rare substance is found in Massachusetts, at Bolton, and in Elba.

PETARD, in the art of war, a bell-shaped engine, made of gun-metal and loaded with from 9 to 20 lbs. of powder. It was employed to break down gates, bridges, barriers, &c., to which it was hung by means of a wooden plank attached to it. It was also used in countermines to break through the enemy's galleries. Petards are now no longer employed in warfare, as gunpowder in loose bags has been found equally efficacious.

PETCHORA, a river of Russia, rises in the north of the government of Perm, on the western slope of the Ural Mountains; flows almost due west, then turns north across the eastern part of the government of Vologda, enters the government of Archangel, and on reaching lat. 66° N. makes a long curve south-west to lon 52° E., when it suddenly turns due north and falls into a bay of the Arctic Ocean by a

great number of mouths; total course, about 900 miles. Its principal affluents are the Ijma and Ussa.

PETER THE APOSTLE was a Galilean fisherman from Bethsaida. He was the son of Jonas. His original name was Simon, but this was changed by Christ to Peter, and we frequently find both names applied to him in conjunction. When first introduced to us in the Scripture narrative he seems to have been residing with his wife and mother-in-law in the village of Capernaum, on the shores of Lake Gennesaret, where he exercised his calling. He was conducted to Christ by his brother Andrew, a disciple of John the Baptist who had attached himself to Christ on hearing John's declaration regarding him. Jesus greeted Simon with the significant words, 'Thou art Simon the son of Jona; thou shalt be called Cephas' (in Greek, *Petros*, a stone). Peter did not at this time follow our Lord as a regular disciple; this he did not do till his second call after the miraculous draught of fishes, when Christ told those whom he had called that thenceforth they should be fishers of men. The age of Peter at the time of his call is uncertain; it is probable, however, that he was between thirty and forty. After this event he was a close attendant upon Christ, and one of his most confidential disciples. On more than one occasion he was the recipient of peculiar marks of favour from our Lord, and though his prominence is by no means to be regarded as indicating any supremacy over his fellow-apostles, or any distinction of office, that such prominence was his cannot for a moment be questioned. By Christ himself he was designated as the rock upon which the church should be built; and though the interpretation of this passage has been of a very various and conflicting character, it most probably referred to the prominent part Peter was to take in founding the church, and may even be regarded as having found its fulfilment when on the day of Pentecost three thousand were converted through his preaching. There is no reasonable ground for supposing that any primacy, in the Roman Catholic sense, was conferred on Peter. The impetuosity of his character led him, especially in the early days of his apostleship, to commit many faults which drew upon him the rebuke of his divine Master. The grievous sin he committed in thrice denying his Lord, followed by his bitter tears of repentance, seems, however, to have been the means of working a great change in his character, and rendering him the fitter to carry out the Saviour's injunction of feeding his lambs. Repentance for this crime purified and strengthened his noble heart, which glowed with a warm love of Jesus. His zeal and eloquence made him often the speaker in behalf of his fellow-apostles on important occasions; as, for instance, at the feast of Pentecost, after the ascension of Christ, where Peter had the boldness to preach the gospel publicly for the first time, and before the Jewish council, where he defended the new faith. Though Peter was the apostle of the circumcision he was made the first medium for the communication of the Holy Spirit to the Gentiles in the conversion of Cornelius and his household. His opinions had great influence in the Christian churches, and on his proposal the apostles and elders of the first synod at Jerusalem resolved that a conformity to the laws of Moses should not be required of the Gentile converts to Christianity. Peter on several occasions came in contact with the great apostle of the Gentiles Paul, one of them being the memorable occasion on which he incurred the stern rebuke of that apostle in consequence of his behaviour towards the Gentile Christians in regard to social intercourse. After the circumstance here referred to we have no distinct notices in Scripture of either his abode or his work. There are good historical grounds for supposing that he visited Corinth at an early period; but that he preached the gospel in the countries of Asia is purely conjectural. Early ecclesiastical tradition associates the name of Peter with the churches of Antioch and Rome in addition to that of Corinth. From his first Epistle it appears that he visited and resided for some time in Babylon, unless, as many suppose, this is to be taken as a mystic appellation for Rome, which is not likely. With regard to his connection with Rome, whatever Roman Catholic writers may maintain as to a lengthened residence there, a point on which they are very much at variance amongst themselves, it may be regarded as settled that he did not visit Rome before the last year of his life. The evidence for the martyrdom of Peter at Rome is of such a nature as to carry with it great weight, and place the matter almost beyond doubt. The concurrent testimony of several of the early fathers is to the effect that he was a joint-founder of the church at Rome, and suffered death in that city. At the same time these fathers are so far from asserting that he was the sole founder or resident head of that church, or that the see of Rome derived from him any claim to supremacy, that they implicitly, if not expressly, deny it. The exact time of his death is not ascertained, but he is generally believed to have suffered at the time of the Neronian persecution, about 64 A.D. The only written documents left by Peter are his two Epistles. The genuineness of the First Epistle is placed beyond all reasonable doubt, both the external and internal evidence being of the strongest description; that of the Second, however, has been disputed by numerous critics on what appears to be plausible grounds. To this epistle few references, and none of a positive character, are found among the early fathers; in style it differs much from that of the First; while its striking resemblance to the Epistle of Jude is considered irreconcilable with the position of Peter. Doubts of its genuineness existed in the time of Eusebius, and it was not admitted into the canon till 393. But notwithstanding these objections, which seem to convince many able writers of the spuriousness of the epistle, there are many who deem that these objections are not unanswerable. Its genuineness is the more eagerly contended for that its rejection would invalidate the authority of the whole canon. In answer to the first objection it is urged that the silence of the fathers is accounted for more easily than the admission of the epistle into the canon after the question as to its genuineness had been raised. The difference of style between the two epistles is admitted on all hands; but this difference might be accounted for by the employment of an amanuensis, or in some other way. The resemblance of its style to that of Jude does not necessarily imply that the epistle was copied by the writer from that author. On the whole it may be said that while the evidence for its genuineness is not of the strongest, the objections, on the other hand, brought against it are not of such a nature as to warrant us in rejecting it as spurious.

PETER THE CRUEL, King of Castile and Leon, born at Burgos in 1334, succeeded to the throne of his father Alfonso XI. on the death of the latter in 1350. His reign was characterized by one long series of cruelties and despotic acts. The year following his coronation, at the instigation of his mother, Maria, to whom, in conjunction with the prime minister Albuquerque, he transferred his powers by reason of his youth, he put to death Eleanora de Guzman, his father's mistress. At the house of Albuquerque, who paved the way for his vicious career, and assisted in corrupting his heart, the young king met Maria Padilla, for whom he immediately

conceived a violent passion. But at this time (1353) he married, though contrary to his will, Blanche of Bourbon, one of the most accomplished princesses of the time, whom, however, he abandoned two days after his marriage in order to rejoin Maria Padilla. Albuquerque, for remonstrating with him, was obliged to flee, fearing for his life, to Portugal, where he was soon afterwards followed by the queen-mother. Left now in unrestrained authority Peter gave himself up entirely to his own wilfulness. He dismissed all the creatures of his former minister, raising his mistress' relations to the highest honours; imprisoned his wife, while he obtained a divorce from her by a convention of bishops; and married the beautiful Donna Juana de Castro, whom he, however, abandoned in a few months. His persecuted relations and disappointed favourites now united against him and raised a revolt, at the head of which were his natural brothers Tello and Henry of Transmatara. Finding himself abandoned by all his subjects Peter was obliged to deliver himself up to the rebels. The tide of popular opinion, however, soon turned, and having effected his escape he found himself at the head of a large army, and ere long succeeded in suppressing the revolt. The most unscrupulous means were now resorted to by him for the removal of his enemies; poison and the poignard were freely used, and amongst those who perished by the former was his divorced wife Blanche in 1361. Soon after he lost Maria Padilla by death, and thereupon declared to the states of Seville that he had been regularly married to her, and succeeded in having her children —the Infant Alfonso, who soon after died, and three daughters—recognized as heirs to the throne. In 1366 his natural brother Henry, supported by Bertrand Dugueselin, set himself at the head of Peter's discontented subjects, and Peter, distrusting his troops, fled on the approach of the enemy to Galicia, and sailed from Coruña to Bayonne, where he gained over Edward of Wales (the Black Prince) to his interest, and was promised an army to re-establish him on the throne. While Henry entered Castile amid universal acclamation, and was crowned by the title of Henry I., Peter pressed forward at the head of an English host, and on the Plain of Najara, in the province of Burgos, gained a signal victory. Having thus been again seated on the throne he gave full scope to his vengeance. All the adherents of Henry, however remote, were punished with death or confiscation; and many of the noblest ladies in Castile suffered execution. Meanwhile, however, Henry was not inactive. Having been recognized by Pope Urban V. at Avignon, he passed the Pyrenees in 1367 with a small but valiant army, which as it proceeded was rapidly augmented by friends and adherents, who flocked from all quarters—the monstrous cruelties of the king having completely alienated from him the hearts of his subjects. On March 14, 1369, Peter was vanquished at Montiel, and took refuge in the castle of that town, whence, however, he was treacherously decoyed by Dugueselin, and brought into the presence of his brother Henry. Mutual upbraidings were succeeded by a resort to their swords, and Peter fell mortally wounded. His death took place on March 23, 1369. Voltaire has made Peter the subject of one of his tragedies, Don Pèdre.

PETER THE HERMIT, an enthusiastic monk of Amiens, who, about the close of the eleventh century, roused Europe to the first Crusade (see CRUSADES). Peter, who had made a pilgrimage to Jerusalem, instigated by the difficulties he had undergone, flew at his return to Pope Martin II., and under the auspices of that pontiff preached to an assembly of more than 4000 of the clergy, with 30,000 laymen, that met at Piacenza, the wild project of driving the Mohammedans from Jerusalem. The success of his enthusiastic harangues was proportionate to the boldness of his scheme and the ignorance of his auditors. Peter himself led the way through Hungary at the head of an undisciplined multitude of more than 30,000 men, a comparatively small number of whom survived to reach the city. Peter distinguished himself by his personal courage at the storming of the holy city; and, having witnessed the accomplishment of his undertaking, returned to his native country, where he founded the abbey of Noirmoutier, and died its first superior in 1115.

PETER, the name of four kings of Aragon, of whom the two last are most celebrated:—1. PETER III., born 1236, succeeded his father, James I., in the thrones of Valencia, Aragon, and Catalonia (1276), while his brother James became king of Majorca. He had early distinguished himself in the wars against the Moors. In 1262 he married Constanzia, daughter of Manfred, king of Sicily, and thereupon, after the execution of Conradin, formed the plan of delivering Sicily from the usurper Charles of Anjou. He succeeded, though by very treacherous means (1282). (See SICILIAN VESPERS.) Though both he and the Sicilians were excommunicated by the pope Sicily continued in his power, and was ruled by cadets of the house of Aragon till the end of the fifteenth century. When the Prince of Salerno, the son of Charles of Anjou, was taken prisoner by Peter in a sea-fight near Naples the pope preached a crusade against him, and made a grant of his crown to the French king, Charles of Valois, who in 1285 invaded Catalonia. James, Peter's brother, kept him in check, defeated him at sea, and compelled him to return. Peter III. died in 1285.—2. PETER IV., usually surnamed *the Ceremonious*, born in 1319, was great-grandson of Peter III., and son of Alfonso IV., whom he succeeded in 1336. After he had crowned himself, instead of leaving the coronation to be performed, as hitherto, by the Archbishop of Saragossa, he restricted the legislative powers of the crown vassals, abolished their claims to act independently of, and even against the crown, and appointed in their stead a supreme judge, under the name of *justicia* (*Justitia Aragonum*), who should take cognizance of, and decide the disputes between the king and the states, and the states among themselves. As his brother-in-law, James II., king of Majorca, had on this occasion supported the crown-vassals Peter deprived him of his crown, and united the kingdom of the Baleares to that of Aragon, but sold to France the lordship of Montpellier, then belonging to it. While he made himself feared abroad he also knew how to secure respect at home. The Moors felt the vigour of his arm; in league with Pisa he vanquished a powerful party in Sardinia that wished to keep the island separate from Aragon, and then obtained a grant of the island from the pope; he also engaged in war with his namesake Peter the Cruel, king of Castile, and with Charles the Bad, king of Navarre. To favour his ambition he seized Maria, the daughter of Frederick, king of Sicily, when she was proceeding to join John Galeazzo of Milan, to whom she was betrothed, and married her to his grandson Martin. His expedition against the dukedom of Athens, to which his thirst after new dominions tempted him, completely failed in 1382. After he had, in 1386, celebrated the jubilee of his reign of fifty years he died at Barcelona in 1387. According to monkish historians nothing troubled his death-bed so much as the encroachments he had made on the church.

PETER I. (THE GREAT), ALEXEIEVITCH, Emperor of Russia, born 9th June, 1672, was the eldest son by his second wife of the Czar Alexei or Alexis

Mikhailovitch, who had two sons and several daughters by his first wife. His elder brothers, Fedor and Ivan, were feeble in constitution. Fedor succeeded his father in 1676, and died in 1682. Ivan, who was wholly incompetent to reign, renounced the crown in an assembly of magnates, and Peter was declared czar, with his mother, the Czarina Natalia Kirillovna, as regent. This arrangement did not please Sophia, the third daughter of Alexis, an ambitious princess who had hoped to reign in the name of her feeble brother. She roused the Strelitz or body-guard, a body of troops easily excited to insurrection, and had Ivan proclaimed czar jointly with Peter, and herself regent. Peter was relegated to private life, and his education purposely neglected. He grew up in habits of rude debauchery, to which he was always addicted; but gave early proof of capacity, and under the guidance of the Genevese Lefort he took enthusiastically to the study of military science. He organized his companions into a company, in which he himself served, and which he constantly augmented until it became the nucleus of the Russian infantry. In 1689 he married Eudoxia Fedorovna, a young lady belonging to a powerful family, the Lapuchin. This alliance enabled him openly to oppose his sister, and in the course of this year he succeeded after a brief struggle in wresting the power from her. She was confined in a convent, where she died in 1704. Peter was now virtually sole emperor, though, till the death of his brother in 1697, he associated his name with his own in the ukases of the empire.

The civilization of the empire had been begun by his father, who encouraged manufactures, and invited foreigners to his court. Peter had profited by his intercourse with these strangers, particularly Lefort, who was his chief counsellor, and had already conceived those vast plans of improvement which he set himself to execute with all the energy of superior genius combined with a half-savage nature. With the assistance of Lefort and Patrick Gordon he began to organize his army, but his great ambition was to form a navy. He went himself to Archangel, and cruised on board Dutch and English ships. He brought Dutch and Venetian ship-builders to Russia, and sent Russians to Venice, Holland, and Leghorn to learn ship-building. At length a fleet, which he had constructed on the Voronej, floated down the Don, and enabled him to conquer Azof from the Turks. His reforms excited great opposition among the Boyars or nobles. A few years after his marriage he repudiated his wife for the encouragement she gave the reactionary party. In 1697 he suppressed with great barbarity a revolt of the Strelitz. Leaving his capital under the military command of Gordon, he then proceeded on that remarkable tour through Europe, in which his vast designs for the improvement of his people first began to appear. He formed an extraordinary embassy to Holland, which he accompanied incognito. Passing through Lívonia and Germany he took up his residence in August at Saardam, a famous ship-building port. Here he purchased tools and the dress of a dockyard artificer, and for several months worked for wages as a ship-carpenter. At the same time he investigated every manufacturing process to which he had access with inexhaustible curiosity. A bar of iron forged by him at Olonetz is in the Academy of Sciences at St. Petersburg. In 1698 he spent about three months in a similar manner in England, where also, as in Holland, he procured a great number of sailors and artificers, as well as engineers, for a great canal which he projected between the Don and the Volga. After their day's work he and his companions used to retire to the public-house at Rotherhithe to smoke and drink beer and brandy. He afterwards visited Vienna, where he particularly acquainted himself with the organization of the army. He was about to proceed into Italy, when he received intelligence of another revolt of the Strelitzes excited by his sister Sophia. He immediately set out on his return, and reached Moscow in September. Gordon had already repressed the revolt, and a savage vengeance was taken on the insurgents, the czar himself, and the principal persons of his court on his compulsion, acting as executioners on the offenders. The czar then resumed his wonted occupations. He organized his army on the German model; he himself served in it as a private soldier, and worked his way up through all the subordinate grades before he received a commission, an example which he compelled the young nobles to imitate. He served as a lieutenant at Narva, and as a colonel at Poltava. He obliged his subjects to adopt European costume by taxing their long Tartar robes. He emancipated the women from Asiatic seclusion. He reformed the calendar in 1699. He committed the charge of the public revenue to a regular administration, made himself virtually the head of the church, forbade religious vows before fifty years of age, and subjected the priests to taxation. He founded schools of navigation and mathematics, brought cattle and herds from Silesia, called into his dominions foreign artisans of all kinds, established manufactories of arms, tools, and fabrics, and distributed metallurgists through the mining districts of Russia. Such were the peaceful occupations of his whole reign; but he could not rest satisfied till he had given Russia a sea-board, and this could only be done at the expense of Sweden. Accordingly in 1700, when he thought his army was ready, he joined Denmark and Poland in a league against Charles XII., the plan of which he had already discussed with Augustus II. on returning from his foreign tour. Before taking this step he had in vain offered to purchase from Sweden a port in the Baltic. His defeat at Narva, 30th November, 1700, and other early reverses, did not discourage him. He knew the Russian army had to learn to conquer, and he was willing to pay the price. In the two following campaigns he gained some advantages over the Swedish generals, and in 1703 his conquests enabled him to accomplish his great object by laying the foundation of St. Petersburg on the Neva. The decisive victory of Poltava in 1709 confirmed and extended his conquests; but the war dragged on for several years, and Turkey becoming involved in it he nearly threw away all his successes by allowing himself to be hemmed in by the Turkish army on the Pruth. In 1707 he had married his mistress (see CATHARINE I.), and it was by her address he was saved from this predicament. She opened negotiations with the grand-vizier, and procured a peace, with the relief of the Russian army, for the surrender of Azof and some small forts on the Black Sea. In gratitude for this deliverance he publicly solemnized his marriage with Catharine in 1712, and afterwards instituted an order in her honour. In 1713–14 he conquered Southern Carelia and Aland. In 1717, having no longer anything to fear from Sweden, he undertook a second tour through Europe, in which he visited France. His return was celebrated by another holocaust of victims. His eldest son Alexis had been brought up by his mother, Eudoxia, and was in open sympathy with the reactionary party. Peter compelled him to sign a renunciation of his right to the succession, which he intended to confer on the son of Catharine. Being still unsatisfied with the conduct of the young man, he had him tried by his council and condemned to death, 5th July, 1718. Immediately after his condemnation Alexis was seized with a violent illness, of which he died on

the 7th of July. In 1721 he abolished the patriarchate, in pursuance of his plan of subjecting the church to the crown. Projects of peace with Sweden had for some years been under discussion, and the czar had lent his countenance to several wild schemes of Charles XII. or his minister Görtz; but the death of Charles, in December, 1718, had put an end to these by changing the policy of Sweden; the war with Russia again became more active, and was waged both by sea and land to the advantage of the latter power. The Peace of Nystadt was signed in 1721, by which the czar retained nearly all his conquests, including Livonia, Esthonia, part of Carelia, Viborg, and the adjacent islands. He relinquished the greater part of Finland, and paid to Sweden about £400,000. The senate after this peace conferred on him the title of Emperor of all the Russias, to which were added the epithets of the Great and Father of his Country. In 1723 Peter founded the Academy of Sciences at St. Petersburg. For some time before his death he suffered from a painful disease of the bladder, which he attempted to alleviate by hard drinking. Having rashly gone into the water to rescue a boatful of soldiers who had been cast ashore on Lake Lagoda, he took inflammation and died, 28th January, 1725. His son Alexis had left children, and his eldest daughter was married to the Duke of Holstein Gottorp; but he had caused Catharine to be crowned in the previous May. He had been alienated from her by the discovery of her infidelity, and it is doubtful in what disposition he died; but by the influence of Mentchikoff and the new Russian party she was declared his successor. He left a Journal of his Campaigns against Sweden, published in 1773 by order of Catharine II., letters, and translations of French works on mechanics, hydraulics, &c.

PETER II., Alexeievitch, Emperor of Russia, grandson of Peter the Great, and son of Alexis, ascended the throne in consequence of the will of Catharine I., in 1727, when but thirteen years old. He died in 1730 of the small-pox, and was succeeded by Anna Ivanovna.

PETER III. (Feodorowitch), Emperor of Russia. As the male line of the Romanoffs ceased with Peter II., the Empress Elizabeth, daughter of Peter I. and Catharine I., agreeably to the order of succession enjoined by her father, appointed Charles Peter Ulrich, duke of Holstein-Gottorp, son of her sister Anna Petrovna and the Duke of Holstein, her successor in 1742, and in 1745 she married him to the Princess Sophia Augusta of Anhalt-Zerbst, who, on joining the Greek Church, took the name of Catharine. Peter III. ascended the throne in 1762. His first step was a reconciliation with Frederick II., to whom he restored the conquered Kingdom of Prussia Proper, and sent 15,000 men to assist him. He established some salutary laws; but a conspiracy broke out which put an end to his life, after a reign of six months. His predilection for the people of Holstein, his attempts to establish Prussian tactics, and to overthrow the privileges of the great, had made him numerous enemies. This conspiracy broke out in the night of July 8, 1762. (See Catharine II.) He abdicated the throne, July 10, but could not save his life by this means. He was, it is said, killed at Ropscha, a seat of Count Rasumoffsky, July 17, 1762. See Orloff.

PETERBOROUGH, an episcopal city and parliamentary borough of England, in the county and 43 miles north by east of the town of Northampton, on the left bank of the Nen, is an important railway centre, the main line of the Great Northern running through it, and branches of the Great Eastern, London and North-Western, and Midland Railways running into it. It is also the centre of a large agricultural district, its corn and stock markets being of great importance. The principal building is its cathedral, founded by Peada, son of Penda, fourth king of Mercia, in 655, and destroyed by the Danes in 870. Being rebuilt in 966 the valuable gifts bestowed upon it by Edgar caused the name of the city to be changed to Gildenburgh, 'the golden city,' which title ultimately gave place to its present name, derived from the saint to whom the church is dedicated. In 1116 great part of the edifice was destroyed by fire, and in the following year its restoration was commenced; but not till the opening of the sixteenth century did the structure assume its present aspect. The prevailing character of the building is Norman, but it exhibits examples of transition, early English, decorated English, and perpendicular styles. The most commanding feature of the building is the west front, consisting of three magnificent pointed arches 80 feet high, surmounted by pediments and pinnacles, and flanked by turrets with spires and pinnacles. The whole front forms a square of 150 feet in height and breadth. Catharine of Aragon, wife of Henry VIII., was interred in this cathedral. The building is now (1884) undergoing extensive alteration and restoration. The minster precincts show the remains of a cloister, a fine perpendicular gateway leading to the deanery, a massive tower and gateway conducting to the bishop's palace, and an old chapel, now used as a grammar-school. Other public buildings are seven churches, a number of Nonconformist chapels, the town-hall, corn exchange, county court offices, three banks, and a post-office. There is a training-college for Church of England schoolmasters, grammar-school, middle-class school, and several public elementary schools. There are also an infirmary and dispensary, and monastic alms-houses. Peterborough received a municipal charter in 1874. It returns two members to Parliament. Pop. (1881), 22,394.

PETERBOROUGH, Charles Mordaunt, Earl of, born about 1658, son of Lord Mordaunt, whom he succeeded in his title and estate in 1675, was engaged in the expedition to Tangier in 1680, in which he served with distinction against the Mohammedans. He went over to Holland in the reign of James II., and, entering into the scheme of his dethronement, returned to England with his successor, by whom he was created Earl of Monmouth, and appointed first commissioner of the treasury. He succeeded to the earldom of Peterborough on the death of his uncle in 1697, and in 1705 was employed as joint-commander with Sir Cloudesley Shovel of the English army in Spain, in the war of the Spanish Succession. He distinguished himself greatly by his courage, activity, and conduct in taking Barcelona, and obtaining many advantages over the French, in consequence of which he was appointed generalissimo of the imperial forces, and received the thanks of the British Parliament. In 1710–11 he was appointed ambassador to Turin and other Italian courts, and in 1712 Governor of Minorca. In 1713 he was made a Knight of the Garter, and was sent on an extraordinary embassy to the King of Sicily. In 1722 he was made general of the marine forces of Great Britain. His death took place during a voyage to Lisbon in 1735. Lord Peterborough was intimate with his literary contemporaries, and was himself a writer of poetry, some of which has been published. In the Correspondence of the Countess of Suffolk, edited by Mr. Croker, are several of his letters.

PETERHEAD, a seaport in Scotland, in the county and 26 miles N.N.E. of Aberdeen, on a peninsula, the most easterly point of Scotland, with a harbour on either side of it, communicating by a cut across the

isthmus. The town is substantially built of granite, obtained from quarries in the neighbourhood. It has two Established churches, besides other places of worship; a town-hall with a spire 110 feet high, a market-cross, a custom-house, a number of excellent board and other schools. There is here a woollen factory, three saw-mills, and also a granite polishing work. Owing to improvements on its harbour (including the rebuilding and extension of Port Henry, the original harbour) the town has a rapidly increasing trade, chiefly in herrings. The Greenland whale and seal fisheries are still important industries. Peterhead belongs to the Elgin group of parliamentary boroughs. (See ELGIN.) Some miles from the town are the interesting ruins of the castles of Ravenscraig and Inverugie, the latter once the seat of the Keiths, earls-marischal of Scotland. There is at Peterhead a statue (presented to the town by William I., emperor of Germany) of James Keith, field-marshal in the Prussian service, who was killed at the battle of Hochkirch in 1758. Pop. (1881), 11,316.

PETERHOF, a village in Russia, in the government and about 10 miles W.S.W. of St. Petersburg. Its great and only attraction is its imperial palace, built in 1711 by Peter the Great, on the plans of the celebrated Le Blond. It is a large but not very regular edifice, situated on a height on the Gulf of Finland, and surrounded by beautiful gardens, adorned with fountains, cascades, and grottoes. Pop. 7745.

PETERLOO MASSACRE. The name popularly given to the dispersal of an open-air meeting in favour of Parliamentary Reform, held on 16th July, 1819, in St. Peter's Field, Manchester. The meeting was dispersed by yeomanry cavalry, under orders of the magistrates. A number of persons were injured, and some killed. The word Peterloo is a burlesque of Waterloo. The number of persons assembled is said to have been 60,000, and the number of killed is stated at eight.

PETER PENCE. An annual tribute paid by England to the pope from the Anglo-Saxon period to the Reformation. It is said to have been originated in 721, by Ina of Wessex, for the purpose of supporting an English college at Rome, and a similar grant was made by Offa of Mercia in 790. Some authors fix its origin much later, but still within the Anglo-Saxon period. The tax consisted of a silver penny for each household. It was paid at the feast of St. Peter *in vinculis*. It was at first regarded as an alms, but subsequently became a consuetudinary tribute, and ecclesiastical censures were levelled against those who neglected to pay it. In the laws of Edward the Confessor and William the Conqueror it was limited to those 'qui haberent 30 denariatas vivæ pecuniæ in domo suâ.' It was prohibited by Edward I. and Edward III., abolished by Henry VIII., revived by Mary, and finally abolished by Elizabeth. A voluntary revival of this tribute for the purpose of supporting a volunteer force to maintain the secular power of the pope was promoted by the Roman Catholic clergy in 1860. It was levied chiefly in France and Ireland, but proved an entire failure.

PETER-PORT, ST., a town in the Channel Islands, capital of the Island of Guernsey, on the shore of a bay on the east side, occupying the slope of a hill, and presenting a very attractive appearance from the sea. The streets are narrow, steep, and crooked, but mostly well paved, and many of the houses have been rebuilt or refronted within recent years. The environs are exceedingly beautiful, being studded with the handsome residences of the gentry, who all live outside the town. The most interesting buildings are St. Peter's church, with a tower in the centre, surmounted by a low spire; St. James's church, Elizabeth College, Ladies' College, public hospital, and the covered market, one of the handsomest and most commodious to be seen anywhere. There are here two or three chapels of ease, and several places of worship for Dissenters, a public library, court-house, prison, and several banks. The harbour is very large and commodious, the mail steamers being able to come alongside the piers at all states of the tide. The roadstead affords convenient anchorage. Fort-George, a regular fortification of considerable strength on the heights, stands about ½ mile south from the town. Pop. in 1881, 16,588.

PETER'S, SAINT, Cathedral of Rome. There is a non-historical legend that St. Anacletus, the successor of Peter as Bishop of Rome, erected an oratory on the present site of Saint Peter's to commemorate the site of the apostle's martyrdom, and that of many of the early Christians of Rome. In 306 Constantine the Great erected on this spot a basilica of great magnificence, which was richly adorned with the spoil of antiquity. Plans both of the interior and exterior of this building remain. In the time of Nicholas V. it threatened to fall into ruins, and that pontiff determined on its reconstruction. The work was begun in 1450, on the plans of Rossellini and Battista Alberti. After the death of Nicholas little was done till the pontificate of Paul II. (1464–71). Julius II. (1503–13) decided on the erection of an entirely new building, and intrusted it to Bramante, who decided on an imitation of the pantheon of Agrippa, with a great cupola supported by four colossal pillars. The building was to be in the form of a Greek cross. After the death of Bramante his plans were carried out under the pontificate of Leo X., by Giuliano di Sangallo, and by Raphael, who changed the plan of the building to a Latin cross. Baldassare Peruzzi, who succeeded him, reverted to the Greek cross. The tribune was completed by him during the pontificate of Clement VII. Paul III. employed Antonio Sangallo, who returned to Raphael's plan, but both he and his successor Giulio Romano died before they could carry out their plans. Michael Angelo, then in his seventieth year, was now (1546) intrusted with the work, with unlimited powers to alter or pull down the work of his predecessors. He adopted the Greek cross, enlarged the tribune, and formed a new project for the dome, declaring his intention to raise the pantheon in the air. At his death, in 1564, the drum of the dome had been finished, and he left exact plans for the completion of the work, which were strictly followed by his successors Vignola and Piero Ligorio. Giacomo della Porta completed the dome under Sixtus V. in 1590. In 1608 Paul V. employed Carlo Maderno to complete the nave and façade. The design of Michael Angelo was now for the first time abandoned, and the Latin cross reverted to. The nave was finished in 1612, the façade and portico in 1614, and the church was dedicated by Urban VIII., on 18th November, 1626. The colonnade which surrounds the piazza was begun by Bernini in 1667, and the sacristy erected by Carlo Marchionni in 1780. The dome as formed by Michael Angelo is double, and the stairs which lead to its summit pass between the inner and outer cupola. Its interior diameter is 139 feet, the exterior diameter 195½ feet; its height from the pavement to the base of the lantern 405 feet, to the top of the cross outside 448 feet. The length of the cathedral within the walls is 613½ feet; the height of the nave near the door 152½ feet; the width 87½ feet. The width of the side aisles is 33¾ feet; the entire width of nave and side aisles, including the pilasters that separate them, 197¾ feet. The height of the baldacchino is 94½ feet. The circumference of the pillars which

support the dome is 253 feet. The façade is considered out of proportion to the building, and prevents the dome from being seen from the exterior in its full proportions, and in harmonious combination with the rest of the building. The proportions observed in the interior details prevent the beholder from being at once struck with its vast size, all the figures being so adjusted to the laws of perspective as to appear of life size. In the tribune or upper end of the nave beyond the transept is the chair of St. Peter. The cost of St. Peter's is estimated to have exceeded £10,000,000.

PETER'S (SAINT) COLLEGE, Cambridge, or PETERHOUSE, was founded in 1257 (charter 1284), by Hugh de Balsham, bishop of Ely, for a master and fourteen fellows. By the revised statutes, 29th June, 1882, the foundation consists of a master, eleven fellows, and twenty-three scholars at least. The master, who is elected by the fellows, must be a Master of Arts, or of some equal or superior degree, in the University of Cambridge or Oxford. The fellows must be graduates belonging to the college, or, at the option of the society, belonging to other colleges of Cambridge or Oxford. One of the fellowships is entitled a professorial fellowship, and can be held only by a professor of the university. The ordinary tenure of a fellowship is six years, but any fellow who becomes head or fellow of another college vacates his fellowship in this college, and any fellow who has been presented by the college to any benefice of the annual value of £400 or more vacates his fellowship a year after presentation. Fellowships may be tenable for over six years, and even in some cases for life, as for example by any fellow who serves the college as tutor, assistant tutor, senior bursar, or dean, or who holds a professorship. The society may also elect as fellows men eminent for science or learning, whether graduates of Cambridge or Oxford or not. The buildings consist of three courts of various dates, beginning with the 15th century. A doorway near the hall belongs to the beginning of the 14th century, and is held to be the oldest piece of collegiate architecture in Cambridge. Isaac Barrow, Abp. Whitgift, and the poet Gray were members of this college.

PETERSBURG, ST., the capital of the Russian Empire, is built on a site chosen by Peter the Great at the mouth of the Neva, which here divides into three main branches—the Great Neva on the south, the Great Nevka on the north, and Little Nevka in the middle. The winding course of the river half incloses a tract of land between the main stream and the Great Neva. On this tract, on the south or left bank of the river, a considerable part of the city is situated; a small portion is on the north bank; and the remainder in the numerous islands formed by the different mouths. These various sections are connected by numerous bridges. St. Petersburg is connected with Moscow, Warsaw, and other parts of the empire by railways, which are also united to the general European system. The town is divided into thirteen quarters; one of the finest is the Admiralty; the Vasilevskoi contains the greater number of the literary and scientific institutions. The islands Aptekarskoi, Krestovskoi, Petrovskoi, and others are almost entirely occupied with summer houses and gardens. The site of St. Petersburg is in many respects unfavourable. It is low and marshy, and the atmosphere is constantly charged with humidity. The heat of summer is succeeded almost without transition by the rigours of winter. The Neva is frozen, on an average, during five months of the year, and in extreme seasons for seven. The shortest day lasts 5 hours 47 minutes; the longest, 18 hours 45 minutes. The town is liable to periodic inundations of the Neva, some of which have been formidable. Moreover, the climatic influences of the locality are extremely adverse to the durability of the edifices of St. Petersburg, which is constantly being rebuilt; the excessive humidity disintegrates the stone, and the violent frosts rend it. The insalubrity of the climate is also great. The grandeur and magnificence of the public buildings of St. Petersburg strike the visitor with astonishment, and seen from an elevation the contour of its immense palaces and the gilded domes of its churches form a scene which presents itself to the fancy as a work of enchantment. The streets are long, wide, and straight, and open upon immense squares; the buildings are of colossal proportions, the quays of granite. The defect of the town is the want of a national type. It is a *pêle-mêle* of foreign and classical architectural notions, imitated without maturity of judgment. The abuse of columns, which are profusely used in all the great buildings, is especially conspicuous. The southern part of St. Petersburg has a lively and bustling aspect; the northern division is remarkable for its quiet and deserted appearance. The spaciousness of the city, which is built on an unusually large scale for the number of its inhabitants, makes the appearance of activity in it much less than it would be in narrower thoroughfares. The greatest thoroughfares are the Square or Place of the Admiralty, the quays of the Neva, and the summer garden. The Nevskoi Prospekt is a magnificent street, nearly 3 miles long, and 130 feet wide. St. Petersburg has upwards of 200 churches; of which more than 160 belong to the orthodox Greek Church, about seven to a schismatic body, six to the Catholic, and fifteen to the Protestant professions. The church of St. Isaac's, the most costly of all, is built on a deep bog, of which the surface has been strengthened by a strong framework of timber. It was begun by Catharine II. in 1770, and had been in process of construction till 1859. It can hardly, however, be said to be finished, as it already shows too evident signs of decay. The granite columns are fissured from top to bottom, and the walls are bent in all directions. Very extensive repairs were made in 1874. It is modelled on the Pantheon of Rome, and is one of the largest churches in Europe. It is entirely formed of granite and Finland marble. Forty-eight monolithic columns of red granite, about 30 feet high, adorn its four peristyles. The gilded cupola is surrounded by four smaller domes at the corners of the roof. The interior is profusely decorated with gold, silver, bronze, marble, and precious stones. Among these are two columns of agate and eight of malachite, each of the latter 40 feet in height. The greater part of this church was pulled down in the reign of Alexander I. and Nicholas, and reconstructed on a new plan. The church of St. Peter and St. Paul, built in 1774, is the last resting-place of the emperors, whose sarcophagi are deposited in vaults under the nave. Like several other churches of St. Petersburg, it is stuffed with military spoils, which give it the appearance of an arsenal. The cathedral of Our Lady of Kazan has an image of the Virgin enriched with precious stones and pearls to the value of £14,000. St. Petersburg contains twelve palaces appropriated to the residence of the emperors, of which eight are built of stone and four of wood, which is largely used in the construction of the town. They present a great variety of style and ornamentation. The old palace of Mikhailhoff, or palace of Paul I., presents, it is said, a rare combination of luxury and bad taste. The interior resembles a prison. The new palace of Mikhailhoff is one of the chief ornaments of the capital. Its lower story is surrounded with Corinthian columns, and its portico, supported by ten columns, is of great elegance. The winter-

palace, which was burned down and rebuilt within a year, at the expense of the lives of large numbers of workmen, on the caprice of the Emperor Nicholas, is one of the largest and most luxurious in Europe, but without artistic value. It is the ordinary residence of the imperial family. The court theatre attached to it is of great elegance. The marble palace of Orloff is remarkable for its richness and luxury. The palace of the Hermitage, separated by a narrow street from the winter-palace, with which it communicates by galleries, was built by Catharine II., and is appropriated to a museum, begun from her private collection, and which contains the best collection of pictures in Russia. This collection, containing 2000 pictures, and about as many masterpieces as the principal galleries in other European capitals, is the private property of the emperors. The French, Flemish, and Dutch schools are represented with great completeness; the Italian school is more numerous, but less select; the Spanish school is also liberally represented by about 100 pictures, while the Louvre has only about thirty. The Russian school is only represented by about thirty pictures. There is a colossal statue of Peter the Great, in bronze, in the square called by his name. It is placed on an immense block of Finland granite, which shows deep signs of the disintegrating effects of the climate. There is a monolithic Doric column of granite, 80 feet high, erected by the Emperor Nicholas to the memory of Alexander I. It is also rent and split by the weather. The Academy of Sciences has devised a cement to fill its crevices, by which its duration has been prolonged. The Admiralty, a vast parallelogram of brick, contains a naval museum, a museum of natural history, and a library. Ships of war, built in the docks here, are carried down the Neva to Cronstadt. The arsenal possesses a museum of artillery. The palace of the general staff contains many of the government offices. The senate has a handsome palace in the square of the same name. The custom-house, exchange, and bank are the chief commercial buildings. The fortress of Petropavlovsk, the Russian bastille, is situated near the church of St. Peter and St. Paul. St. Petersburg possesses numerous hospitals and charitable institutions, a university founded in 1819, and numerous special academies. The Academy of Sciences has an extensive museum, embracing numerous departments; and there are several other collections besides the pictorial one already adverted to. The imperial library of St. Petersburg is one of the most valuable in the world. It contains, according to different estimates, from 600,000 to 900,000 volumes, 30,000 manuscripts, and 75,000 engravings. The collection has been drawn chiefly from the Polish libraries, which were unscrupulously plundered to enrich it, a work which was sometimes intrusted to ignorant agents. The library of Warsaw arrived in an extremely dilapidated condition. There is a story that the Cossacks intrusted with its transportation sawed through the folios which were too large to go into their cases. The library of the Academy of Sciences and that of the Hermitage has each over 100,000 volumes. Out of 120,000 volumes the latter contains only 10,000 in the Russian language. St. Petersburg has four theatres, one for Italian opera, one for Russian opera and comedy, one for Russian and German plays, and one for French and German.

The mortality of St. Petersburg is nearly the highest in Europe; the death-rate uniformly exceeds by some thousands the birth-rate. The trade of St. Petersburg is said, in amount, to be about half that of the whole Russian Empire. The Neva is only approachable for about seven months in the year; but a considerable part of the trade is conducted by railway, so that exact statistics of imports and exports are unattainable. There are glass-works, sugar-refineries, cotton-mills, breweries, and manufactures of tobacco. There are also several government manufactures besides those connected with military and naval equipment, as a carpet manufactory, modelled on that of the Gobelins at Paris; a glass and porcelain manufactory, which is said to be unable to maintain itself against private competition.

St. Petersburg was founded by Peter the Great in 1703, when he had just wrested its site from the Swedes. The forced construction of a city in a site apparently forbidden by nature cost the lives, according to various accounts, of from 100,000 to 200,000 peasants, collected from all parts of the Russian Empire to perform the necessary labours. Even in 1724 the various groups of houses were separated from each other by marshes, and the town was surrounded by forests and deserts. The senate was transferred to St. Petersburg in 1714. The fortress and the admiralty had already been built. The Czarina Anna definitely removed the court to St. Petersburg, which from this time grew rapidly. The winter-palace was built by Elizabeth. The quays and numerous palaces and monuments were constructed by Catharine II. Commercial prosperity, due to the centralization of an autocratic government, likewise shone upon the new capital; but the system of railways having relieved Moscow from its isolation, the main motive for the transference of the capital has ceased to exist, and the restoration of Moscow to its former position, or even the choice of a new capital, has been repeatedly considered. Should such an event happen, of which there is no immediate probability, but which might be brought about suddenly by the caprice of a new czar, the natural disadvantages of St. Petersburg would tell heavily against it, and its decline might be as rapid as its rise. St. Petersburg has suffered from serious inundations in 1752, 1777, and 1824, and from a great fire in 1862. Pop. (1881), 876,575.

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